RUBBER WORLD

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AVAILABLE DRY STYRENE RUBBERS (SBR)—UNITED STATES AND CANADA

By R. G. Seaman, RUBBER WORLD, and C. A. Carlton, J. M. Huber Corp.

A NEW, COMPLETE LISTING! SEE PAGE 421

JUNE, 1959

A BILL BROTHERS PUBLICATION

Chemically Cross-Linked Polyethylene for Wire, page 429

Adduct Rubbers Very Resistant, page 435

RUBBER WORLD, June, 1959. Vol. 140, No. 3. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, 3rd & Hunting Park Av Philadelphia 40, Pa., with Editorial and Executive Offices at 630 Third Avenue, New York 17, N. Y., U.S.A. Second Class Postage Paid at Philadel Pa., under the act of March 3, 1879. Subscription United States $5.00 per year: Canada $6.00; All other countries $10.00. Single copies 50¢ in U $1.00 elsewhere. Address Mail to N.Y. Office.

News about

B.F.Goodrich Chemical *raw materials*

NEW, EASIER PROCESSING POLYMER

HYCAR 1051

offers fabrication advantages with significant physical improvements

Hycar 1051 is the high acrylonitrile polymer of a new series of three polymers that are a major improvement in nitrile rubber. All three produce superior end products. The other two, announced previously, are Hycar 1052, medium high acrylonitrile, and Hycar 1053, medium acrylonitrile.

These three polymers combine a range of oil and solvent resistance superior to other nitrile rubbers, providing improved tensile with higher elongation and lower moduli. Users are enthusiastic. They report reductions in mixing time and lower power requirements on mixing equipment. They also report better mold flow that reduces rejects, and better building tack for making rolls, tank linings, and similar products.

Samples of Hycar 1051, or the other two Hycar polymers in this series, are available with further information. To get them write Dept. CB-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
Reg. U. S. Pat. Office
Rubber and Latex

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers

RUBBER WORLD

ARTICLE HIGHLIGHTS

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630 Third Avenue, New York 17, N. Y.

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VOLUME 140, NUMBER 3 JUNE, 1959

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The opinions expressed by our contributors do not necessarily reflect those of our editors

FEATURE DEPARTMENTS

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VORLD

NEWS of the
RUBBER WORLD

The U. S. Rubber Co. signed a new labor and fringe benefits contract with the United Rubber Workers, AFL-CIO, union on May 1, thus ending a strike of 24,000 of its employes which began on April 9. Seiberling Rubber Co. and General Tire & Rubber Co. signed contracts with the union in May also; there were no strikes at the plants of these companies.

Firestone Tire & Rubber Co. and B. F. Goodrich Co. plants closed by strikes since April 16, gave no indication of reopening in late May. The URW union appeared to be asking more from these companies than it had from others, and the companies were refusing to give more than their competitors.

H. E. Humphreys, Jr., U. S. Rubber chairman, reaffirmed his belief that the rubber industry will set new records in sales and profits this year, in spite of the strike situation. Capital expenditures of $165 million in 1959 by the industry predicted.

Firestone announced a 30-month, $55-million expansion for its worldwide production facilities; $40 million in this country, the balance abroad. Goodrich announced that within two years it will be operating three new tire plants and a synthetic rubber plant abroad in which it will have majority ownership.

Allied Chemical's National Aniline Division is now producing a new Caprolan nylon tire yarn in a new plant in Hopewell, Va. The Du Pont company reports second-line nylon cord tires outperformed more expensive first-line rayon cord tires in taxicab fleet tests in Charleston, W. Va.

Initial Congressional action in refusing to appropriate funds for natural rubber stockpile rotation may indicate eventual reduction of the size of this stockpile.

Esso-Standard Oil Co. introduced the Atlas Bucron (all butyl) tire in 18 eastern and southern states on May 12. Initial marketing was slowed somewhat by strikes in producing plants.

Flintkote Co. announced a new Banbury mixer process for dewatering and drying synthetic rubber said to save $5 to $10 a ton in manufacturing costs while at the same time lending itself to the incorporation of oil, black, etc. during the drying step. An invention of Paul Dasher, Dasher Rubber & Chemical Co., the process is available for licensing through Flintkote's subsidiary, Patent & Licensing Corp.

The five largest tire manufacturing companies are supporting a fundamental research program on tires and auto suspension systems at the University of Michigan. The sponsoring companies will supply physical data from applied research and road tests.

Du Pont's elastomer chemicals department will build a new $6-million research laboratory for work on long-range problems as well as for applied research. International Latex Corp. has built a new million-dollar laboratory for the development of synthetic latices for hundreds of industrial applications.

The International Rubber Study Group estimates that the world will consume 3,520,000 long tons of new rubber this year. Production of natural rubber was estimated at at least 1,970,000 tons. Synthetic rubber production capacity in the free world was said to be 2,040,000 long tons on an annual basis.

The Rubber & Vinyl Flooring Council of the Rubber Manufacturers Association expects sales of 250 million square feet of rubber and solid vinyl flooring with a value of more than $75 million in 1959.

Montecatini of Milan, Italy, through Chemore Corp. of New York, has announced semi-commercial production of ethylene-propylene copolymer elastomers. High quality, low cost, and wide fields of application are claimed for this new material said to have properties very close to those of natural rubber.

The Dayton Industrial Products Co. has been formed in Chicago by Dayton Rubber Co. to handle the parent company's line of industrial and automotive products. In addition to Dayton's existing facilities for these products, a new plant is under construction in Springfield, Mo.

Phillips Petroleum Co. and the Industrial Development Corp. of South Africa, Ltd., have formed the equally-owned Phillips Carbon Black Co. (Proprietary), Ltd., to build and operate an oil-furnace black plant in South Africa.

Letters to the Editor

The story in our March, 1959, issue, pages 897 and 898, by RUBBER WORLD'S *Washington correspondent, John F. King, of the report on the Government Synthetic Rubber Program before the Senate Judiciary Subcommittee on Patents, Trade Marks, and Copyrights by Prof. Robert A. Solo, Economics Department, City College of New York, produced the following letters from The General Tire & Rubber Co., with the request that they be published to set the record straight. In addition, Professor Solo has also written a letter explaining his position in the matter which is also reproduced herewith:*

April 30, 1959

DEAR MR. SEAMAN:

Mr. Robert A. Solo's account of the events relating to the development of oil-extended rubber published by the Committee on the Judiciary under the title of "Synthetic Rubber: A Case Study in Technological Development under Government Direction," and subsequently published in part by RUBBER WORLD in the March, 1959, issue is not in agreement with the facts.

The goal of our original work in oil-extended rubber has been described in RUBBER WORLD previously.[1] The original objective of our research was to prepare a low-cost material which could be used in place of light-colored reclaim. One of the large mechanical goods companies was having problems in obtaining an adequate amount and suitable quality of light-colored reclaims for special mats. Tire carcass scrap containing no carbon black was used as a base for this special reclaim, but had become scarce and, in addition, because of more limited selection, caused considerable discoloration of the compounds and finishes due to some contained antioxidant. This was a large-volume use and one which warranted the work to obtain a suitable solution.

In reviewing the problem with Mr. Pfau and Mr. Weinstock, we came up with the idea that if the rubber was made much tougher, but with a controlled degree of cross-linking, e.g., gel formation, it could be diluted down with large quantities of low-cost oil. In this way a proper balance of cost, processibility, and quality might conceivably be achieved. All of our early rubbers were evaluated with cheap mineral oils and low-cost pigments. Our records show that our first attempts were most discouraging, and that the first workable masterbatches were obtained only after months of diligent effort. Hardly the story of a successful development brought in from outside!

Inevitably the use of reinforcing pigments of various kinds was investigated. We were surprised with the unexpected physical properties and excellent quality obtained by the use of

[1] India RUBBER WORLD, June, 1951, p. 309; July, 1951, p. 435; and Aug., 1951, p. 571.

(Continued on page 340)

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ORLD

Turn the page for all the facts—

Now- GOODYEAR Chemica D

first truly effective combination of stabilizer ar
mixed diaryl-p-phenylenediamine op
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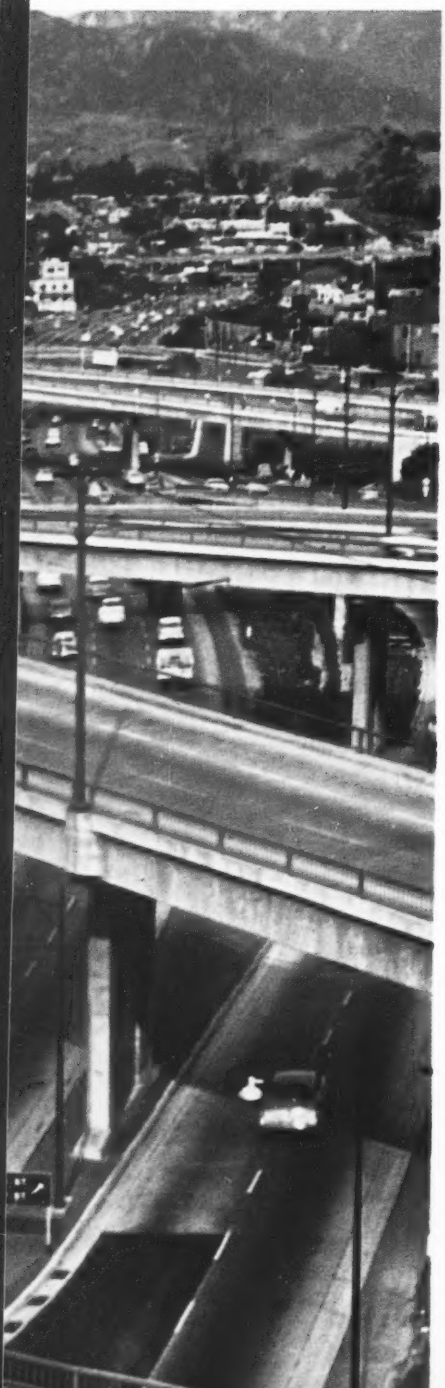


AUTOMOTIVE PRODUCTS

MOLDED GOODS

Here's why new Wing-Stay 100 can mean better products at lower cost–

As a stabilizer for SBR rubbers–

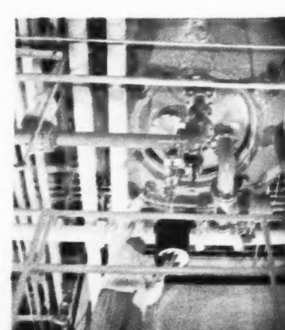
WING-STAY 100 offers these advantages in discoloring-type polymers:

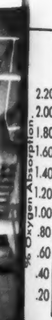
1. Incorporates in much the same manner as phenyl-beta-naphthylamine.
2. Provides resistance to oxidative degradation and flex-cracking which is much above the accepted minimum level.
3. Is vastly superior to standard stabilizers in antiozonant activity.
4. Serves as a better stabilization building block at no extra cost.

As an additive for SBR rubbers–

WING-STAY 100 provides these advantages – as a combination antioxidant and antiozonant – in synthetic rubbers:

1. Incorporates easily
2. Does not accelerate the cure
3. Does not bloom at normal levels
4. Provides much better over-all protection at lower cost

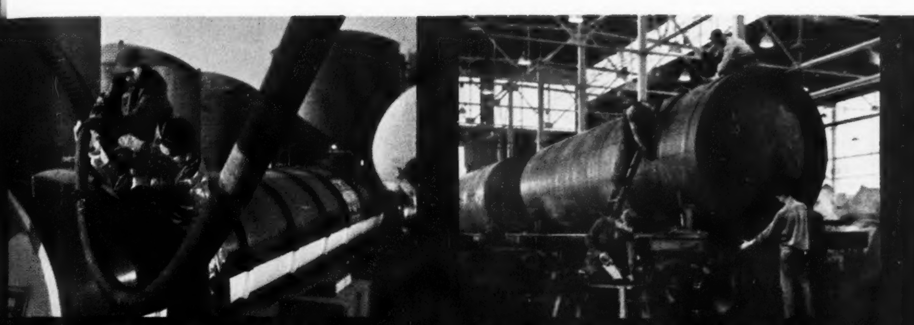




Effec
of

Division offers *Wing-Stay 100*

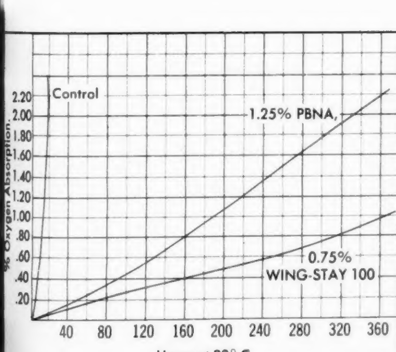
antioxidant and antiozonant. This nonvolatile opens **new avenues of opportunity** these major areas of application—



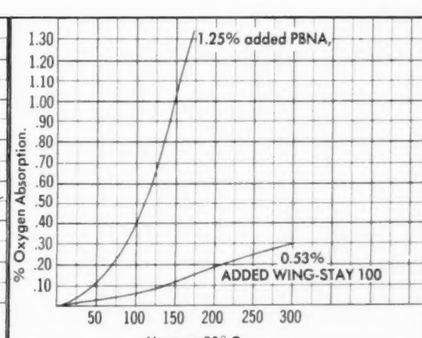
MECHANICAL GOODS

OR A VARIETY OF RUBBER PRODUCTS

Here's proof of new *Wing-Stay 100* superiority—

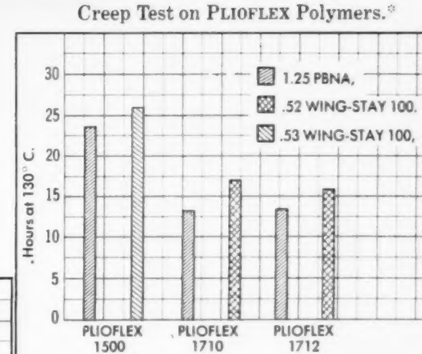


Effect of WING-STAY 100 on the stability of an Oil-Extended SBR Polymer.



Effect of WING-STAY 100 as added stabilizer in a "cold" nonextended SBR Polymer.

Creep Test on PLIOFLEX Polymers.*

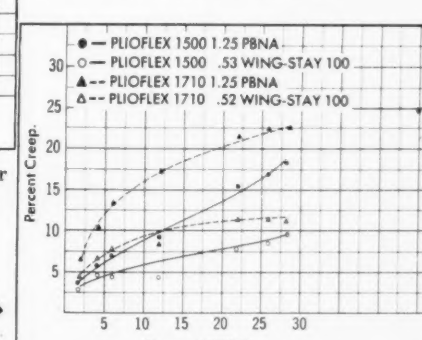


Vulcanized 50 Part HAF Black Compound—Hours to 10% Creep.

*A measurement of oxidative degradation of rubber in air at elevated temperatures.

Creep Test on PLIOFLEX Polymers. ▶

(Black Compounds containing Copper to magnify Oxidative Degradation)



And that's not all!

New Wing-Stay 100 is available now in 3 PLIOFLEX rubbers

THE GREATER PROTECTION of new WING-STAY 100 can be yours—as an already incorporated stabilizer—in three new PLIOFLEX rubbers:

Plioflex 1500C	Plioflex 1710C	Plioflex 1712C
a "cold" nonextended SBR	a "cold" SBR with 37½ parts of aromatic oil	a "cold" SBR extended with 37½ parts of highly aromatic oil

WING-STAY 100 is also available as an easy-to-handle flaked solid. Samples of WING-STAY 100 or of PLIOFLEX rubbers containing it—plus full technical assistance—are yours by contacting your nearest Chemical Division representative or writing: Goodyear, Chemical Division, Dept. F-9418, Akron 16, Ohio

Wing-Stay 100

stabilizer, antioxidant and antiozonant

GOOD YEAR
CHEMICAL DIVISION

Plioflex, Wing-Stay—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio


MUEHLSTEIN
TECHNICAL SERVICE
MUEHLSTEIN'S technical staff is always available to assist our customers in developing economical compounds of proven quality.
Three MUEHLSTEIN laboratories are always at your service.
CRUDE RUBBER
SYNTHETIC RUBBER
UNCURED RUBBER
HARD RUBBER DUST
MASTERBATCH
GROUND STOCKS
SCRAP RUBBER
PLASTICS
SERVICE
QUALITY
INTEGRITY

Letters to the Editor

(*Continued from page 334*)

reinforcing carbon black. This indicated the possibility of using oil-extended rubber in tire treads and other high-quality applications. The properties of a number of the rubbers produced for compounding studies were unexpectedly good and led to the road tests which revealed good abrasion and crack resistance. Many hundreds of polymerization and compounding trials were necessary in order to determine optimum conditions.

These facts which I have discussed can be substantiated by the records as well as by the testimony of the persons who were involved.

There has been much conjecture among technical men in all phases of high polymer research, development, compounding, and production as to why such an invention had not been discovered before. High Mooney rubber was well known throughout the synthetic rubber industry, and many technical papers available to all had been published to demonstrate the intrinsic high quality of such polymers.

High quantities of oil based on the rubber had been used in GR-S rubbers, but the quality of the compounds was invariably low. For high-quality products such as tire treads, it was an accepted truth in the rubber industry that the presence of oil in a natural rubber tread compound was deleterious. Articles in the literature point out that the addition of oil must be kept to the minimum to keep abrasion resistance at the highest possible level. This same idea was carried over to the general-purpose synthetic rubber industry, possibly because as a general rule the same technical man who had worked with natural rubber now found he had to substitute butadiene-styrene rubbers for it. Therefore it was natural to make the rubber softer so that it was not necessary to add appreciable oil for processibility. The deliberate manufacture of tougher polymers that would require much higher quantities of oil for processing was considered to be in the wrong direction.

It is important that the historical facts be made definite. It is only when they are separated from conjecture that they can serve a useful purpose in giving guidance in the future.

The copy of the attached letter by Mr. Pfau, directed to Mr. Solo, recounts the actual sequence of events which occurred from Mr. Pfau's viewpoint. It is requested that both of these letters be printed so that the record is correct.

G. H. SWART
Director of Research,
The General Tire & Rubber Co.,
Akron, O.

April 30, 1959

DEAR MR. SOLO:

Your report titled, "Synthetic Rubber: A Case Study in Technological

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Letters to the Editor

(Continued from page 340)

Development under Government Direction," contains statements which are not in accord with the events as they occurred. A copy of the above subject matter was not made available to us for comments as to the correctness of the opinions you state as facts in the report submitted to the Senate Judiciary Subcommittee on Patents, Trade Marks, and Copyrights.

I will confine my remarks to corrections which should be made in your report, and I particularly refer to the material on pages 101 through 103 of the above mentioned report.

Before doing so, I will clarify my work at The B. F. Goodrich Co. as this bears on the material cited. From 1942 to 1945, I was engaged in synthetic rubber research at Goodrich in the group doing work for the government in their Copolymer Research Program. During this time, I was either author or coauthor of about 15 reports submitted to the Office of Rubber Reserve. Many of these papers had as subject matter the preparation and evaluation of high Mooney synthetic rubber. These high Mooney rubbers gave excellent physical properties but were too tough to be processable on factory equipment.

Later in 1945, I was transferred from the government-sponsored program carried on at Kent, O., to a Goodrich sponsored program in Akron, O., on synthetic rubber research. The objective of this work was to find a superior rubber for tire tread wear. I worked on this program until January, 1948, when the Goodrich Research Laboratory was moved to Brecksville, O. During this period considerable effort was spent on studying high Mooney rubbers as well as working with many other monomers in many types of emulsion systems. Much of the work on Mooney rubbers was devoted to the study of methods to process, by mechanical means, the extremely tough rubbers. A small amount of effort was directed toward trying either to peptize or to plasticize high Mooney rubbers in order to render them processable wthout degradation of the physical properties. The results did not appear promising, and this work was abandoned. It was my opinion, both at the time this work was abandoned and at the time that I left Goodrich, that quality rubber stocks could not be made by adding oil to high Mooney rubber. From about February of 1948, when the laboratory at Brecksville was opened, until February of 1949, when I left Goodrich, I was assigned to other research problems in the latex field.

Many chemists at Goodrich and other companies had access to the information on high Mooney rubbers and many speculated on methods to make the high Mooney rubber processable. This included speculation about using plasticizers, but the concensus of opinion was that plasticizers would degrade the rubber. The emphasis during this

(Continued on page 458)

NEW MATERIALS

Easy-Processing Hypalon 40

A new easy-processng grade of Hypalon has been announced by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Designated Hypalon 40, the new chlorosulphonated polyethylene is reported to have better processability and better physical properties than previous Hypalons. Improvement is claimed for the tensile and tear strength, elongation, compression set, and resistance to abrasion of the vulcanizates, which also have flame and oil resistance comparable to those of neoprene.

Developed by the Du Pont elastomer chemical department, the new elastomer is very close chemically to previous Hypalons and differs from them mainly in the superior results obtained in use. The program of development was based upon selection of the best possible base polyethylene resin and the proper amount of chlorination and sulphonation to provide the basic good properties along with a more easily processed material. The only application not recommended for the new grade is that of solution use. The high solution viscosity of Hypalon 40 makes the lower viscosity Hypalon 30 the preferred grade for solution work.

The resistance of Hypalon to oxygen, ozone, heat, and weathering has been maintained along with the good colorability and color retention. The new grade 40 has been tried in factory applications in wire and cable, hose, coated fabrics, extruded and molded items, with very satisfactory results. The material needs no breakdown and readily accepts fillers. Mill or internal mixes are fast, free from nerve, and free from roll sticking. The thermoplastic nature of the material allows low mixing temperatures with resulting freedom from scorch.

For molding, the material fills the mold quickly and well and has very good hot tear strength. Calendering characteristics are excellent. Films of two mils have been made and removed from the calender by one man without distortion or tearing. Extrusions are smooth, and die swell is low, it is further claimed. Extrusions hold shape well without collapse, shrinkage, or weak spots.

The price of the new material is the same as that of previous Hypalon. Working samples and technical data are available from the company.

SP-1055 Resin

A new, bromo-methyl alkylated phenol-formaldehyde resin which is said to reduce the cure time of butyl rubber and to provide improved heat resistance and compression set properties has been developed by Schenectady Varnish Co., Inc., Schenectady, N. Y.

Designated SP-1055, the new resin overcomes one of the few economic obstacles to the more widespread use of butyl rubber. The new resin, for which patents have been applied, makes it possible to cure butyl rubber in 10 to 60-minute cycles at temperatures of 300-350° F. Unlike present resin-curing systems, no catalyst is required to effect the cure of butyl rubber with SP-1055 resin. Highly uniform cures are achieved with the new resin, and the rate of cure is easily controlled by choosing the proper grade of butyl rubber, according to Schenectady. For example, very rapid cures can be obtained with a grade of butyl rubber possessing a high degree of unsaturation.

With SP-1055 resin, butyl rubber parts can be produced which

will withstand temperatures up to 500° F. for long periods without losing their resiliency. Also, the resin is said to give a safe scorch range for wide process application. Flex life, permanent set and dynamic fatigue characteristics of butyl rubber containing SP-1055 resin are considerably improved in comparison to sulfur-cured butyl, according to the firm. This point was said to have been verified by tests conducted at the Enjay Laboratories, Linden, N. J.

Some typical physical properties of SP-1055 resin have been reported as follows:

Specific gravity	1.06
Melting point (capillary) °F.	124
Color (U. S. D. A. Rosin Standard)	K
Moisture content, %	0.12
Ash, %	0.025

SP-1055 resin is currently in commercial production.

Additional information can be obtained from the manufacturer.

Michigan 1782 MgO

A new grade of magnesia for neoprene compounding, Michigan 1782, is offered by Michigan Chemical Corp., Saint Louis, Mich. Extensive chemical and functional tests indicate that for its application, it is equal or superior to any magnesium oxide for neoprene use now on the market.

Incorporated in standard formulae, Michigan 1782 gives outstanding scorch resistance, with desirable physical properties at the most practical cure rate, it is claimed. The new magnesia has been designed specifically as a curing aid for Neoprene Types W and WRT, particularly in combination with fast accelerators. It has, however, given equally good performance in batches of Neoprene Type GN-A.

Some typical physical properties of Michigan 1782 Mg0 have been reported as follows:

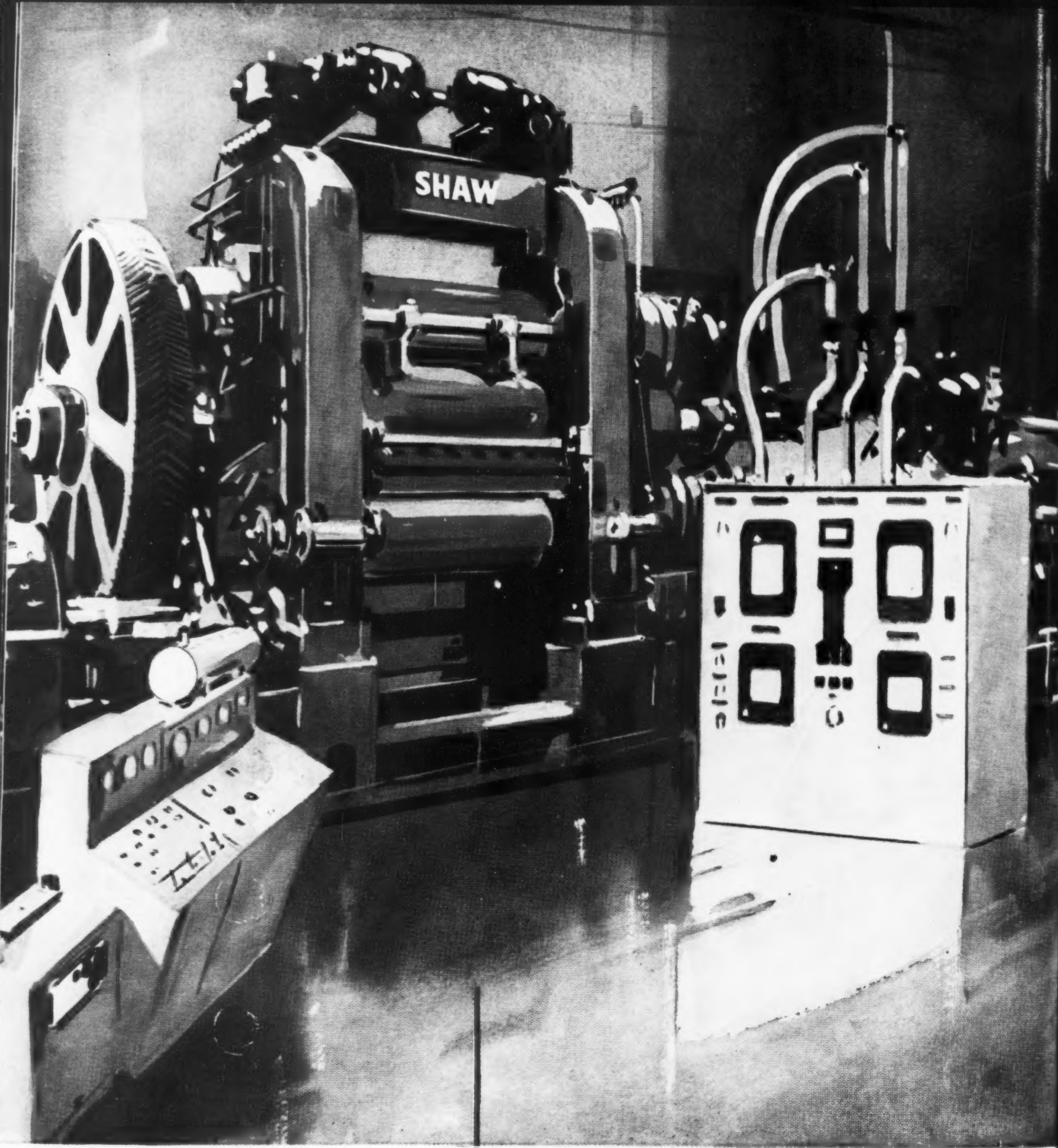
Chemical composition on an ignited basis:	
Magnesium oxide (MgO), min.	98.0%
Calcium oxide (CaO), max.	1.0%
Silica (SiO_2), max.	0.34%
Iron oxide (Fe_2O_3), max.	0.22%
Aluminum oxide (Al_2O_3), max.	0.30%
Loss on ignition, min.	4.0%
Iodine number, mg. equiv. for 100 grams, min.	85
Bulk density, loose, pounds a cu. ft., min	8.0
Screen size:	
Minus 325 mesh, wet, min.	99.5%
200 mesh, wet, min.	99.9%

Michigan 1782 MgO is a highly reactive, purified, fine, white powder. It is said to function efficiently as an acid acceptor, anti-scorch agent, and curing aid, helping to prevent premature vulcanization and bin cure. More detailed information can be obtained from the manufacturer.

Adhesive EX-B150-1

A new adhesive for heat bonding dissimilar unvulcanized elastomers is offered by the special products division, Lord Mfg. Co., Erie, Pa. Designated Adhesive EX-B150-1, it forms a strong and durable bond between many combinations of rubbers such as uncured butyl to uncured neoprene, natural, SBR, or nitrile stocks. The bonds are flexible and retain their strength and dynamic properties after prolonged exposure to heat and flexure. Adhesive EX-B150-1 is said to produce good bonds even if one of the stocks is partly cured; such

(Continued on page 386)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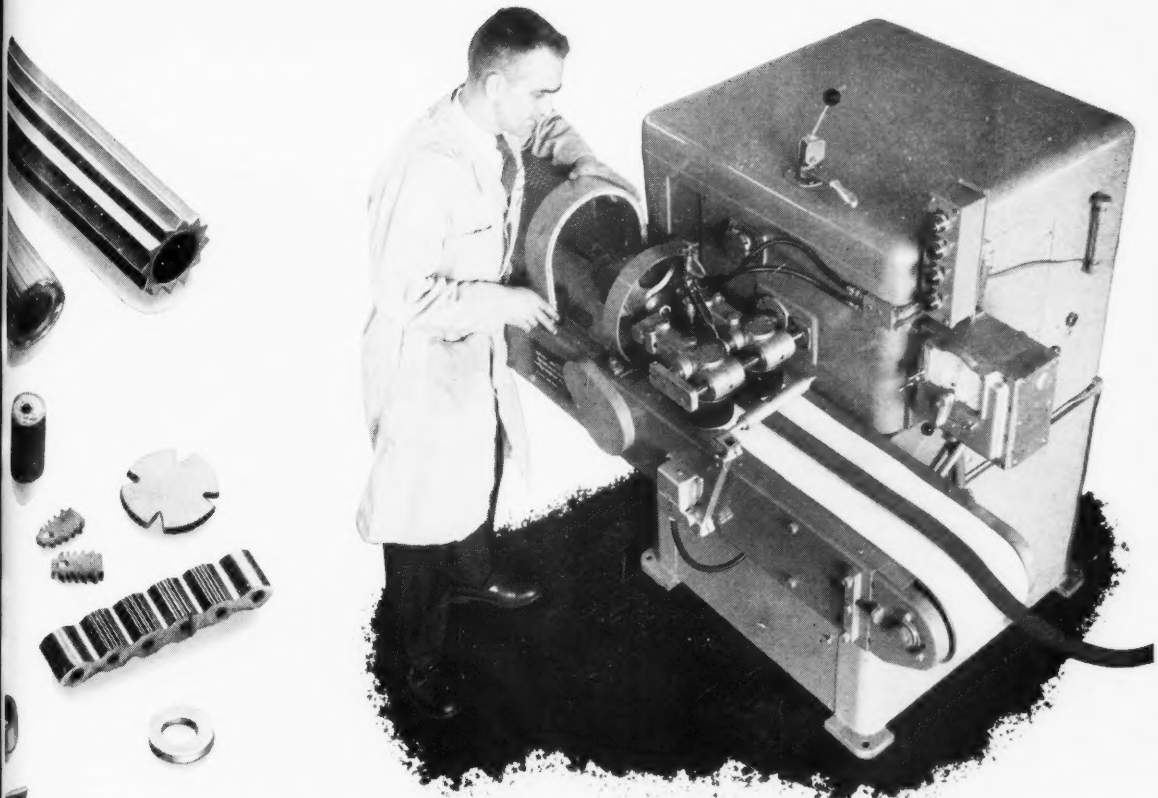
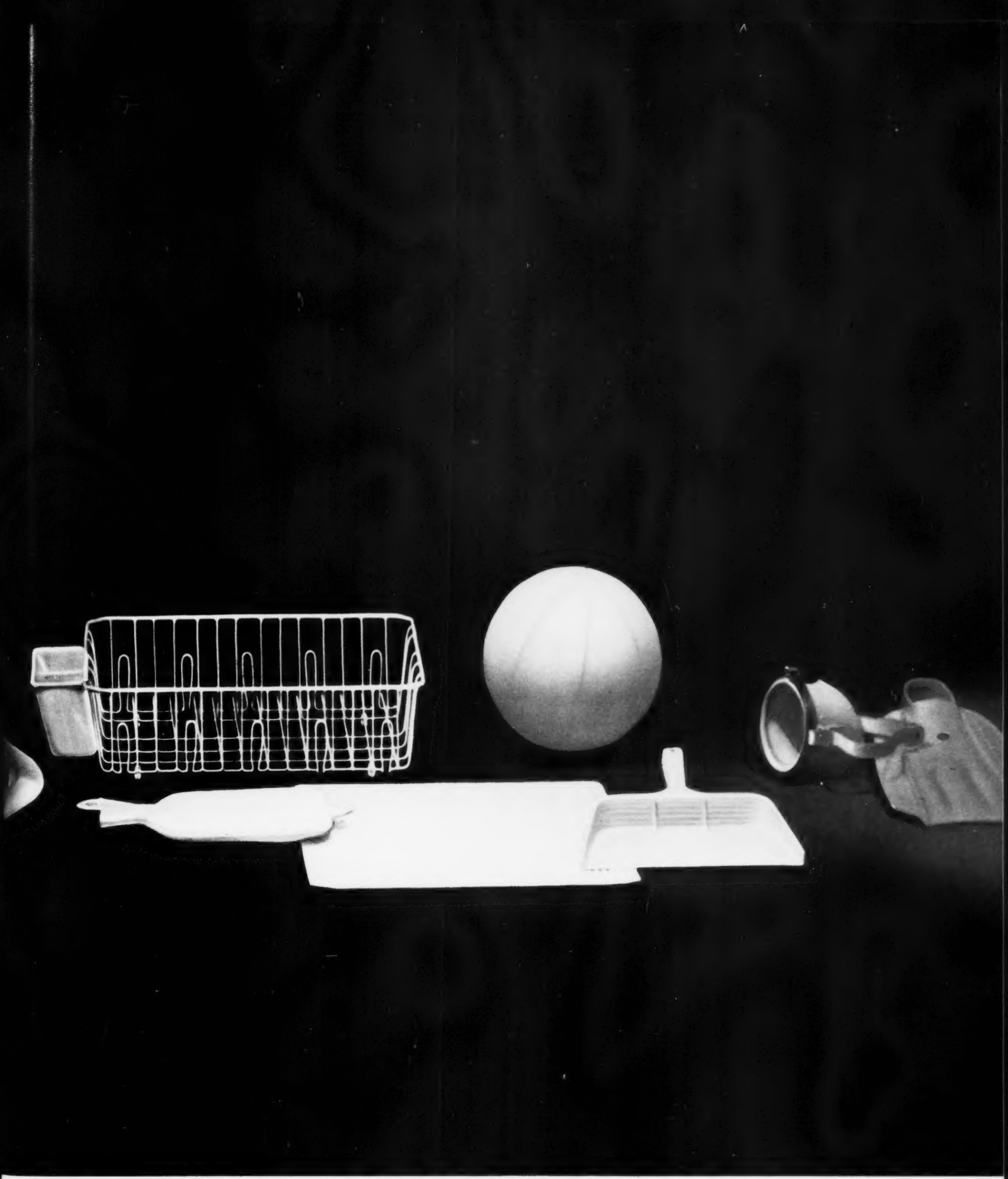




More (SP) Rubber from Malaya

Yes, here is something that is going to make life easier for another production team. They have specified SP (Superior Processing) Rubber because they know that for quality extrusions it pays dividends by speeding production and cutting rejects . . . that it helps them make a better product at lower cost . . . that it makes "difficult" specifications practicable. And for calendering, particularly for hand-built goods, its advantages are quite as striking.

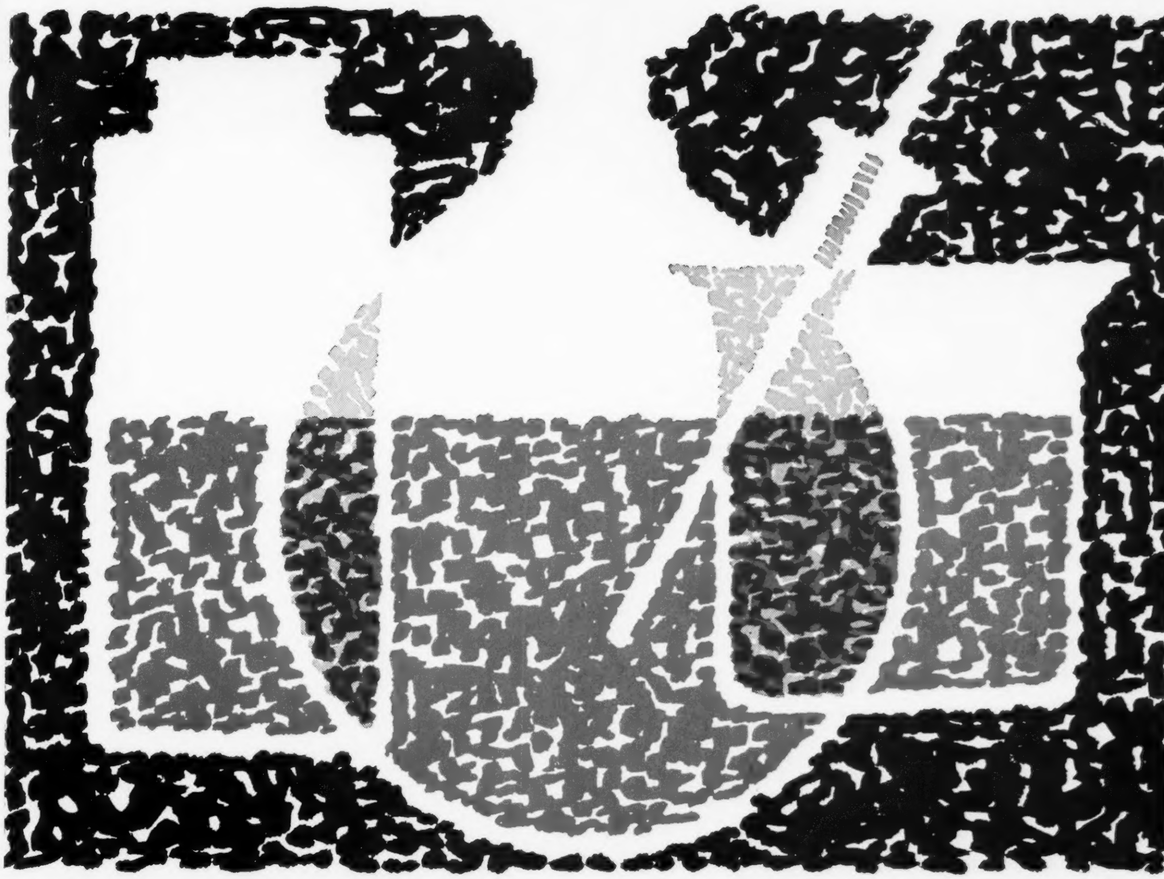
Consumption of this new form of natural rubber already exceeds a four-figure annual tonnage and production is being expanded to meet future demand. It is a controlled product made to the specifications of the natural rubber industry's Rubber Research Institute, Malaya, and is available through normal trade channels. If you would like to know more about SP Rubber please write to us.

NATURAL RUBBER

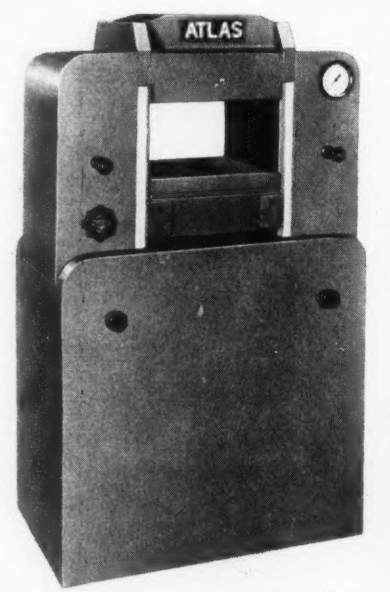
A PRODUCT OF NATURE *plus* SCIENCE

Natural Rubber Bureau

1631 K Street N.W., Washington 6, D.C.



NEW EQUIPMENT



Atlas "200" hydraulic press

Series "200" Presses

Series "200" hydraulic presses, recently announced by Atlas Hydraulics, Inc., Philadelphia, Pa., are a new line of presses especially developed with an ultra-heavy slab side frame for extreme precision molding of rubber. At present these presses are custom built from standard component parts. They are available to meet customer requirements including semi-automatic operation within the outlined ranges.

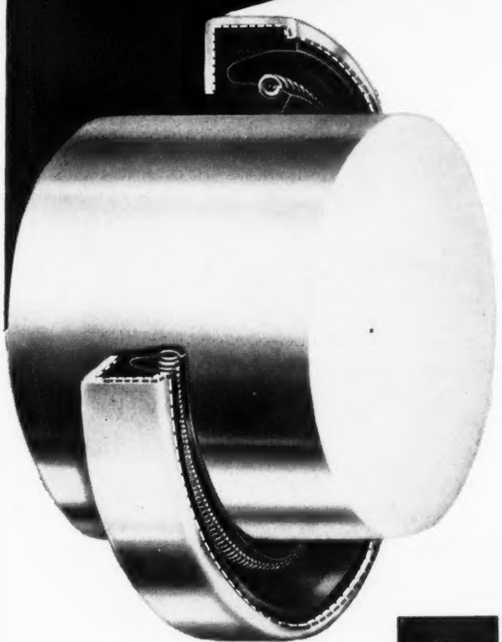
14- by 14-in. platens— 50, 75, and 100 tons' capacity
16- by 16-in. platens— 75, 100, and 125 tons' capacity
18- by 18-in. platens—100, 125, and 150 tons' capacity
20- by 20-in. platens—125, 150, and 200 tons' capacity
24- by 24-in. platens—200, 250, and 300 tons' capacity

These presses are available with self-contained hydraulic units or for use with existing hydraulic systems. Platens are guided by precision 45-degree bronze guides. Platens can be supplied for electric or steam heating. Water cooled platens are also available. The presses are said to be constructed for maximum rigidity and minimum deflection. Design modifications are available to suit customer requirements.

P-H 55 Hydraulic Web Guide

Featuring new and improved power, accuracy, and variety of application, the popular Stanford web guide, manufactured by Stanford Engineering Co., Salem, Ill., is now available in hydraulic form for holding accurate side register in all types of web processing.

(Continued on page 360)



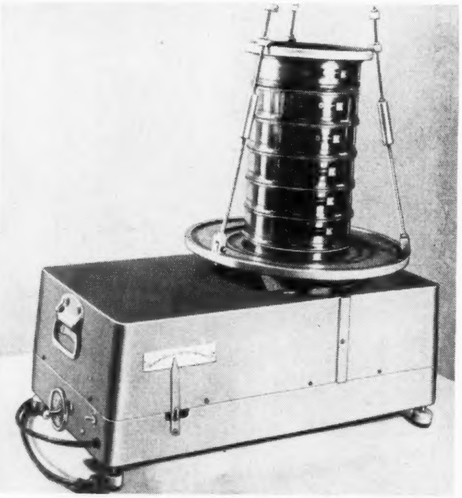
New Equipment

(*Continued from page 356*)

Known as Model P-H 55, the new hydraulic web guide incorporates many exclusive features. The unit develops sufficient power to move the heaviest unwind or rewind rolls, yet provides precision correction to within plus or minus 0.010 inch. The result is savings in time, material, and operating costs in all web-fed operations such as coating, laminating, slitting, printing, calendering, bag-making, etc.

Feature of P-H 55 is the pneumatic-hydraulic automatic pilot. This highly sensitive mechanism receives the signal of any deviation in web path from the sensing head and translates this into proper correction action of the hydraulic power cylinder for immediate repositioning of the web to its true course. The special design of this pilot control is said to eliminate adjustments and the problems of chattering or hunting present in other hydraulic controls.

The P-H 55 hydraulic web guide is available in various combinations of size and power to fit every web processing need. Complete information is available from the company.



Fisher/Wheeler sieve shaker

Fisher/Wheeler Shaker

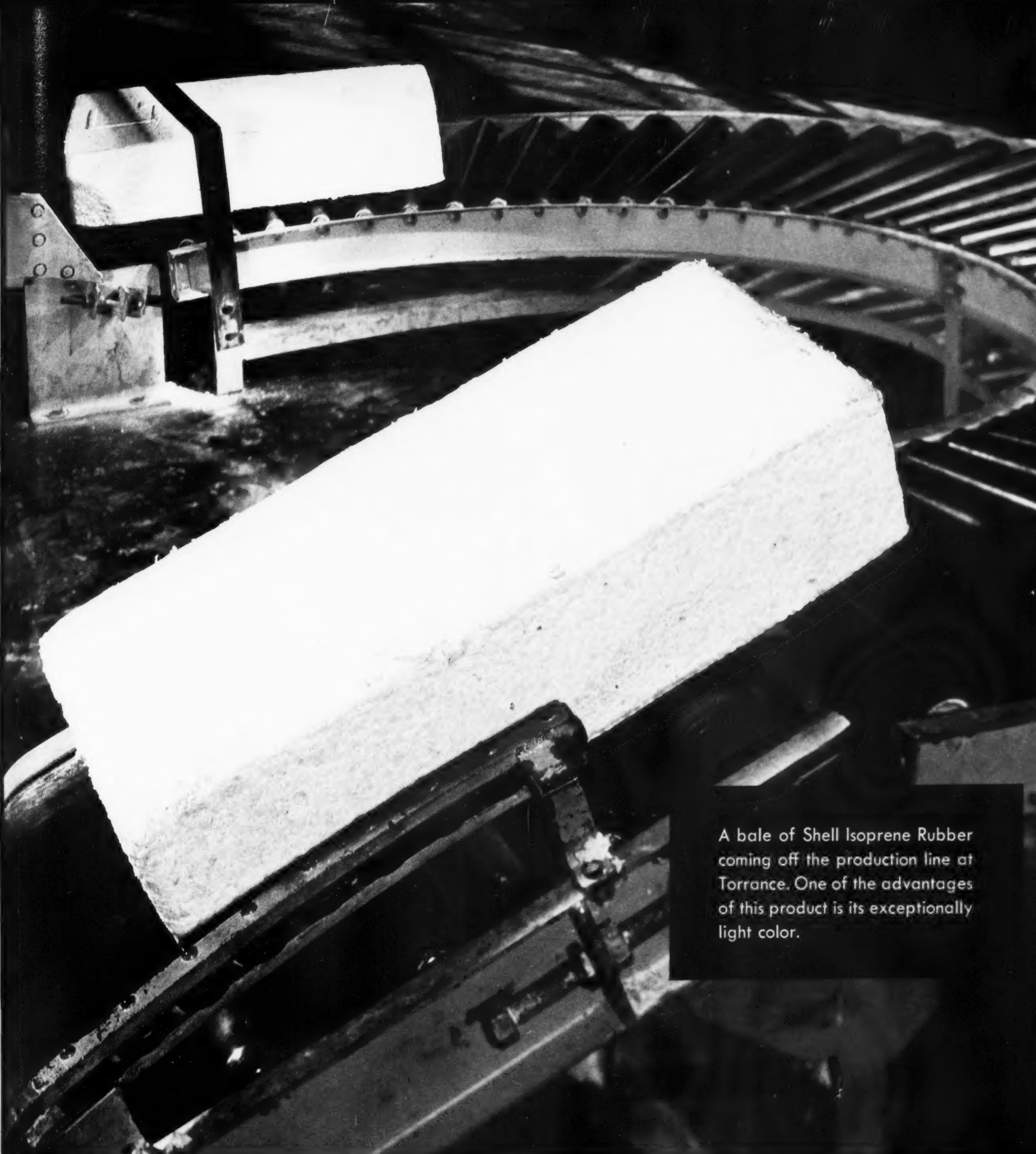
Fisher Scientific Corp., Pittsburgh, Pa., is producing and distributing a sieve shaker that has proved quieter running than any other laboratory shaker, it is claimed. The patented features of the variable-speed Fisher/Wheeler sieve shaker make it suitable for mining laboratories, glass and cement makers, and manufacturers of graphite, pigments, detergents, metal powders, and a wide variety of chemicals. It will handle all the regular ASTM and other standard sieving tests.

The vibrating sieve-table of the shaker gives each particle in the sieve a combined vertical and horizontal motion that keeps the sample uniformly spread over the mesh. The rate of vibration can be varied from 500 to 900 per minute.

A V-belt drive from the ¼-hp. motor works through two counterweighted eccentric arms to shake the sieve-table. The design keeps the vibration from being transmitted through the base of the shaker to the lab bench and other equipment.

The shaker is supplied with a hold-down ring to fit over a stack of eight-inch sieves. The sieve-table is recessed to hold other sizes from six to 16 inches in diameter. Three anchor rods hook over the edge of the top sieve or the rim of the hold-down ring and hold the sieves securely. They can be adjusted to hold stacks from 10 to 18 inches high.

The strong aluminum castings used for the body of the shaker keep its weight down to 110 pounds. It measures 34 by 13½ inches and is 11 inches high without sieves. It runs on 115-volt, 60 cycle ac.



A bale of Shell Isoprene Rubber coming off the production line at Torrance. One of the advantages of this product is its exceptionally light color.

How NS solved another bead wire problem

NEW PACKAGE inside steel "steam box" completely protected bead wire from rust during six week test.

VACUUM SEALING of new polyethylene bag keeps bead wire safe from corrosive atmospheres. After sealing, cardboard outer wrapper is added for additional protection before palletizing.

NEW PRODUCTS

New Firestone Premium Quality Tire with Silver Safety Seal

Firestone Safety Passenger-Car Tire

A new safety tire for passenger cars called the Firestone Premium Quality has been announced by The Firestone Tire & Rubber Co., Akron, O. The tire has two basic innovations. A new, extremely elastic Silver Safety Seal built into the inner part of the tire across the tread area gives the tire a higher degree of puncture-safety than ever before achieved, according to the company. The second feature involves the use of a treated nylon cord in the body of the tire.

The new Safety Seal, made of highest quality compounds including Diene synthetic rubber, grips a puncturing object tightly and maintains an air seal despite the back and forth movement caused by the rotation of a tire. The new Seal replaces the old, gummy sealant which had previously been used.

The treated nylon cord used in the tire is put through a special, three-stage process to remove the nylon's tendency to stretch during the tire manufacturing process and its life on a car. This stabilizing treatment is said to reduce sharply the possibility of the tire losing its shape as a result of cord growth.

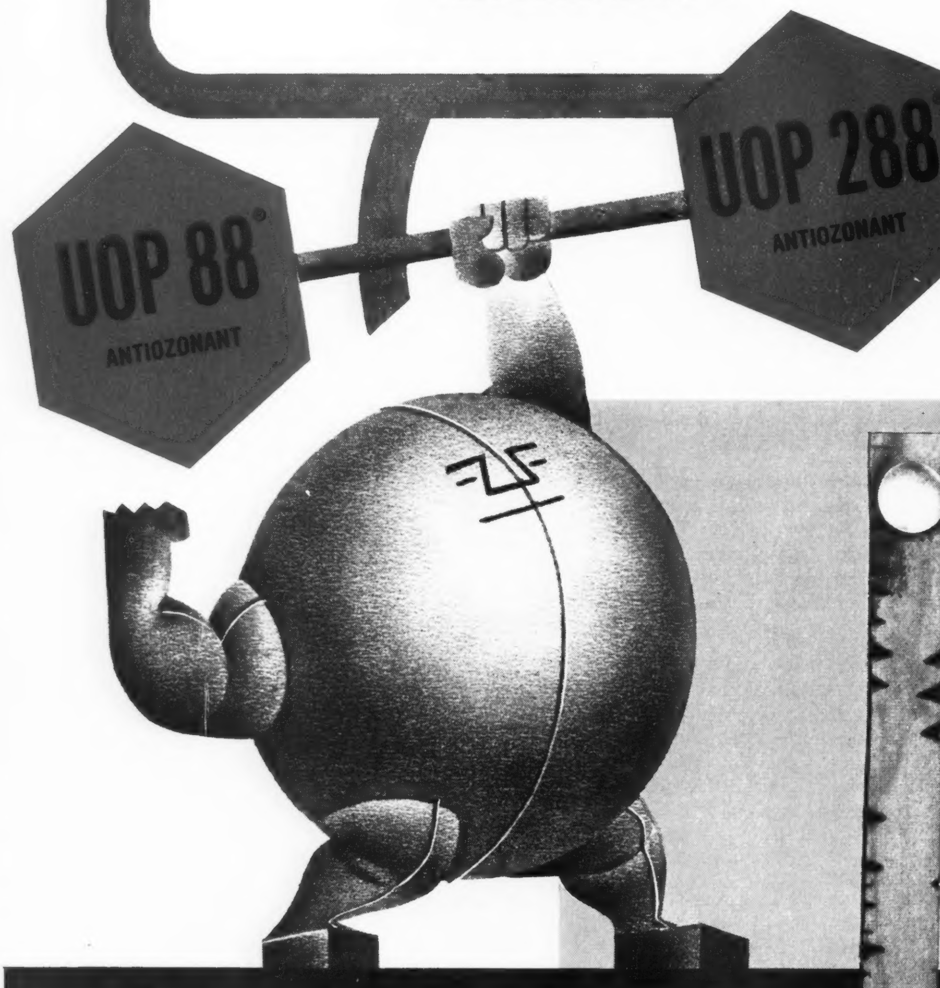
Blowout protection is provided by a patented diaphragm, according to the company. Its construction is similar to that of a regular tire, and this diaphragm is mounted inside the casing of the Premium Quality tire on its bead ledge. The diaphragm, or inner tire, will support the automobile in the event the outer casing is severely damaged and loses its air.

New BFG Flexible Magnetic Koroseal

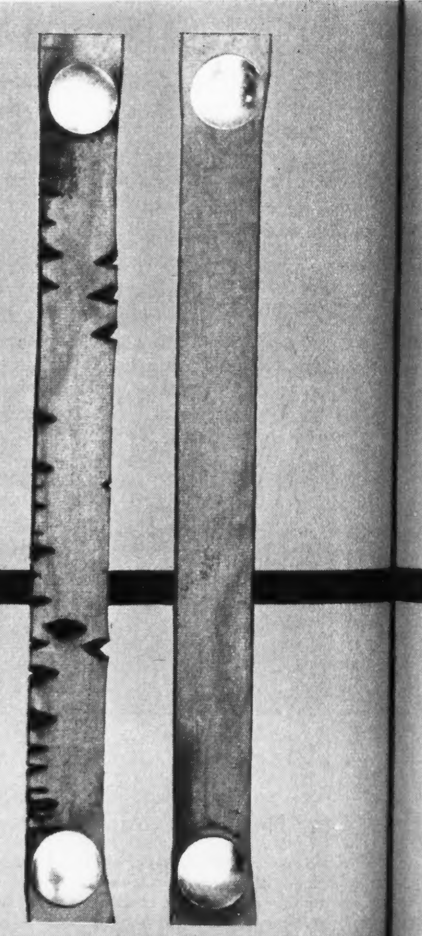
Development and production of a flexible, magnetic material with permanency claimed to be superior to most conventional magnetics has been announced by B. F. Goodrich Industrial Products Co., Akron, O. The new material is Koroseal vinyl plastic specially compounded and processed to react exactly like metal or ceramic magnets. It can be produced in continuous

(*Continued on page 372*)

how can rubber under STRESS fight off ozone attack?



The two test strips at right, both of identical composition including kind and amount of antiozonant, were exposed to 30 pphm ozone at 100° F for 2 weeks at different elongations.



This specimen subjected to 20 percent elongation shows severe ozone cracking.

Specimen subjected to 10 percent elongation shows no sign of ozone cracking.

properly formulated, rubber can withstand ozone, even under severe dynamic service . . .

What happens to a well formulated rubber compound when the vulcanized product is subjected to inherent or applied stresses?

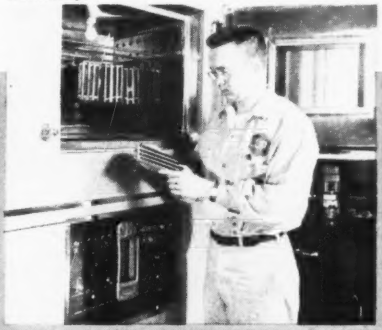
The photos of test strips below give a graphic answer: Ozone attacks the surface of the product and severe cracks develop.

Hence the need for special ozone protection in products likely to be subjected to such service. And special protection means the kind provided by UOP 88 and 288. Unlike other protective measures, UOP antiozonants extend their protection to products under heavy physical stress and dynamic flexing. With a relatively small increase in amount, you can give your product sufficient ozone protection to withstand greatly increased stresses.

In working out rubber formulations involving the use of antiozonants avail yourself of UOP technical service and facilities. Just write or telephone our Products Department.

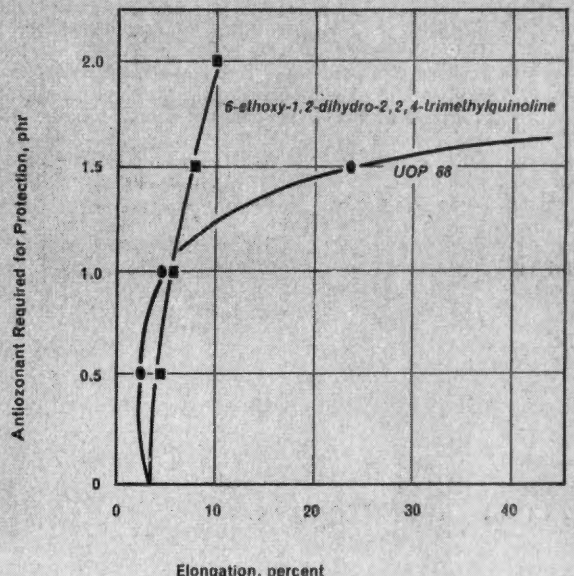
To cover all phases of service conditions, UOP rubber labs conduct dynamic and static tests both indoors and outdoors.

DeMattia flexer is used to evaluate flex-cracking properties of compounds tested in UOP rubber laboratory.



UOP ozone cabinets provide test conditions at a wide range of ozone concentrations.

Test specimens mounted on outdoor racks are examined at regular intervals for evidence of deterioration.



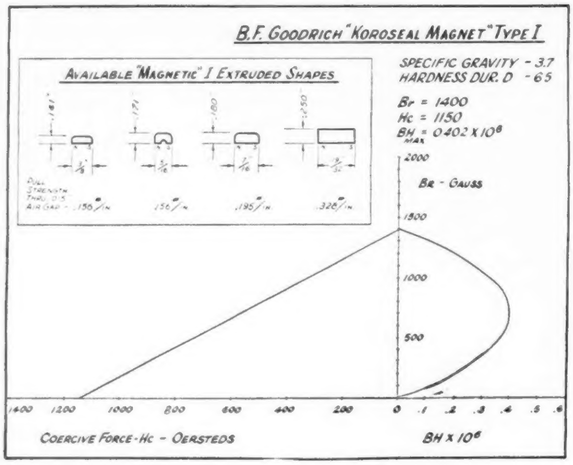
Curves plotted for UOP 88 and a competitive antiozonant show that while antiozonant requirement increases with increased strain, it does so at a far lower rate for UOP 88 than for the competitive material.

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road, Des Plaines, Illinois, U.S.A.

New Products

(*Continued from page 368*)



Magnetic properties and available extruded shapes of magnetic I Koroseal

lengths in an unlimited number of shapes and can be cut without impairing its magnetic qualities.

The flexible magnet, it is claimed, offers designers flexibility, magnetic permanence, availability in unlimited lengths, low cost, good magnetic properties, good aging and chemical resistance, availability in an infinite number of shapes, adaptability for best pole location, and capability of being magnetized with multiple poles.

This magnetic material is actually an electrical insulator, reports BFG. It is unlike iron-type magnets in that it can be spot magnetized or shape magnetized for the most efficient use. The flexible material can have poles across the width or thickness, or along one face with the two poles along the edge, or along one face with alternating poles.

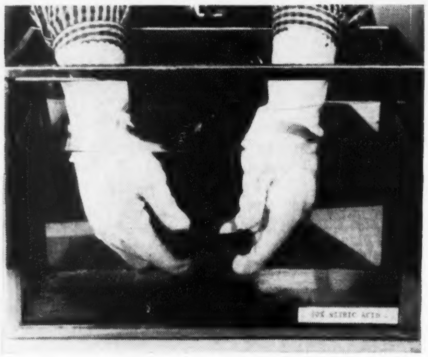
Goodrich is currently extruding the material at a rate of more than 10 miles per week for use in refrigerator gasket seals. The company foresees a vast immediate application of this new development in gasketing materials for washing machines and freezers. In addition to magnetic closures, the material can be used in office supply applications, in electronic applications, and novelties. The compounds can be varied to give desired amount of flexibility and softness, and magnetic strength, according to the company.

Stanflex V-20 Glove

The Pioneer Rubber Co., Willard, O., has added a new V-20 medium-weight model to its line of Stanflex gloves. The new glove, which retains the features of the lighter-weight model, was tested in the field and in the laboratory. The gloves were tested in 50% solutions of nitric and chromic acids (both highly corrosive substances which deteriorate both rubber and synthetic gloves). V-20, made of Pylox, withstood the deteriorating effects of both acids even after 48 hours of immersion. Except for discoloration in the chromic acid solution, the performance tests of the Stanflex V-20 proved more than satisfactory.

Other experiments show that the V-20, used in cleaning component parts in 30% hydrogen peroxide for a large rocket and missile parts manufacturer, performed better then all other gloves tested. Similarly, the V-20's are replacing gloves used in the operation of radioactive acid solutions (HNO_3 and HC1) which normally cause rapid deterioration of thin rubber and synthetic gloves.

The V-20 model is recommended for jobs requiring finger sensitivity. The non-binding design of the tapered fingers and roomy palms give barehand comfort to the wearer. The gloves



New Stanflex V-20 gloves in 50% nitric acid

can also be turned inside out so that the textured inside finish can provide a non-slip grip sometimes required for special handling jobs.

The new V-20 is resistant to alkalies and inorganic acids, oils, greases, and some solvents, it is further claimed. Tests show that rugged Pylox stays flexible even under unusual conditions. Available in small, medium, and large sizes, the new V-20 gloves are said to offer ample wrist protection.

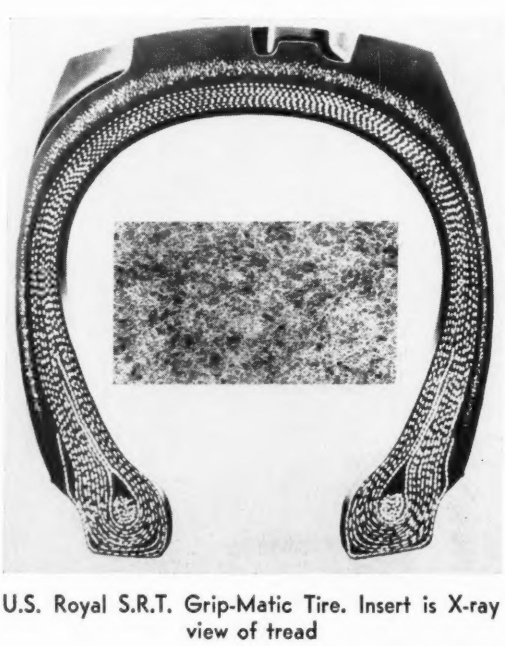
U.S. Royal S.R.T. Grip-Matic Tire

United States Rubber Co., New York, N. Y., has introduced a new industrial pneumatic tire reinforced with short steel fibers for use on materials handling trucks, industrial tractors and trailers, and other heavy-duty applications. Called the U.S. Royal S.R.T. Grip-Matic, the tire is said to give excellent mileage owing to high-quality rubber compounds and the stability of the steel-supported tread, and can be retreaded more times than a conventionally built tire.

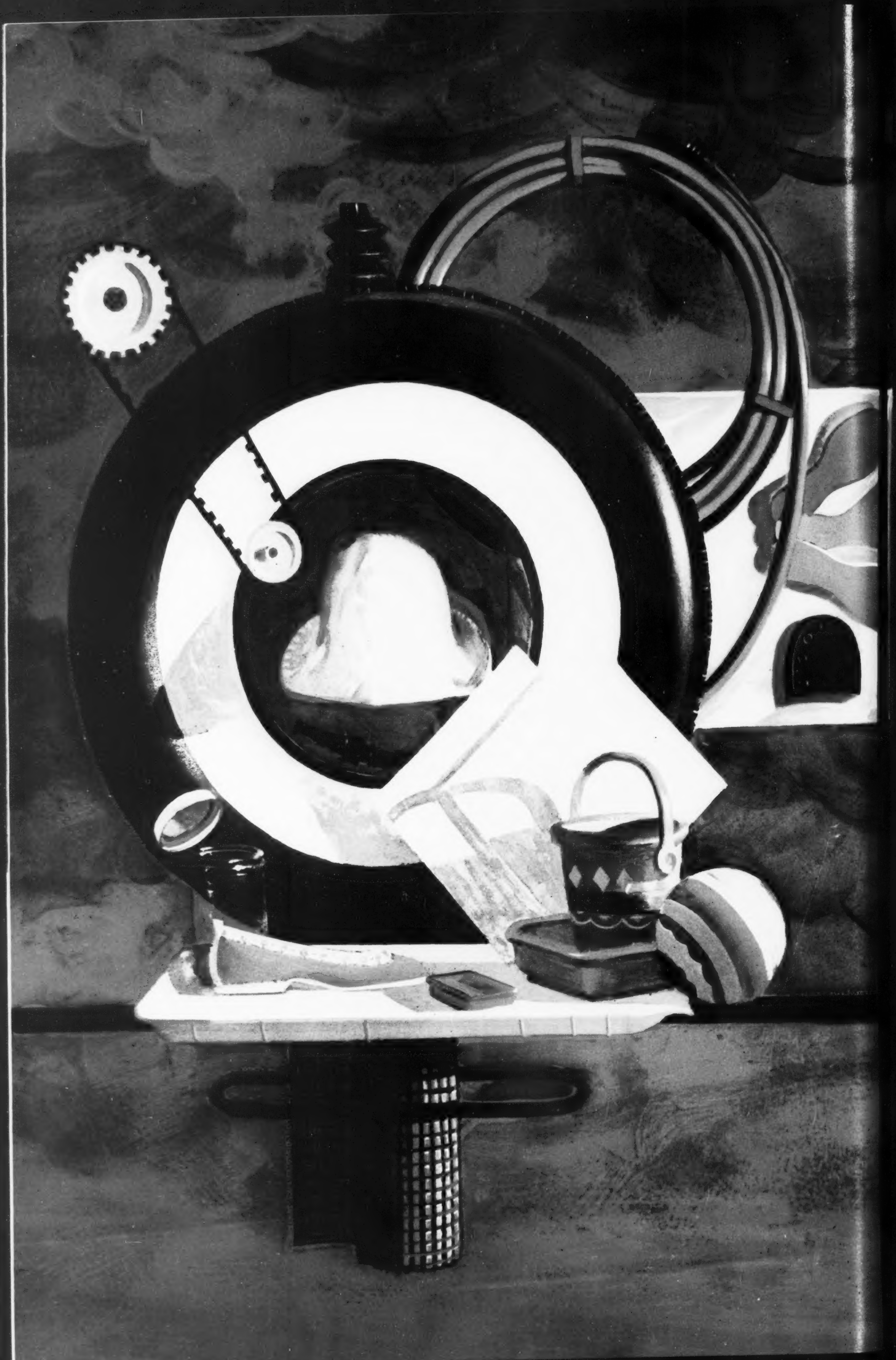
The steel reinforcement in the tire consists of a thick layer of rubber containing thousands of short lengths of hardened steel filaments which are closely interlaced, but individually insulated. This dense mat runs between the cord body and the tread and full sidewall areas of the tire, protecting it from bead to bead against cuts, ruptures, and punctures in the most severe service conditions.

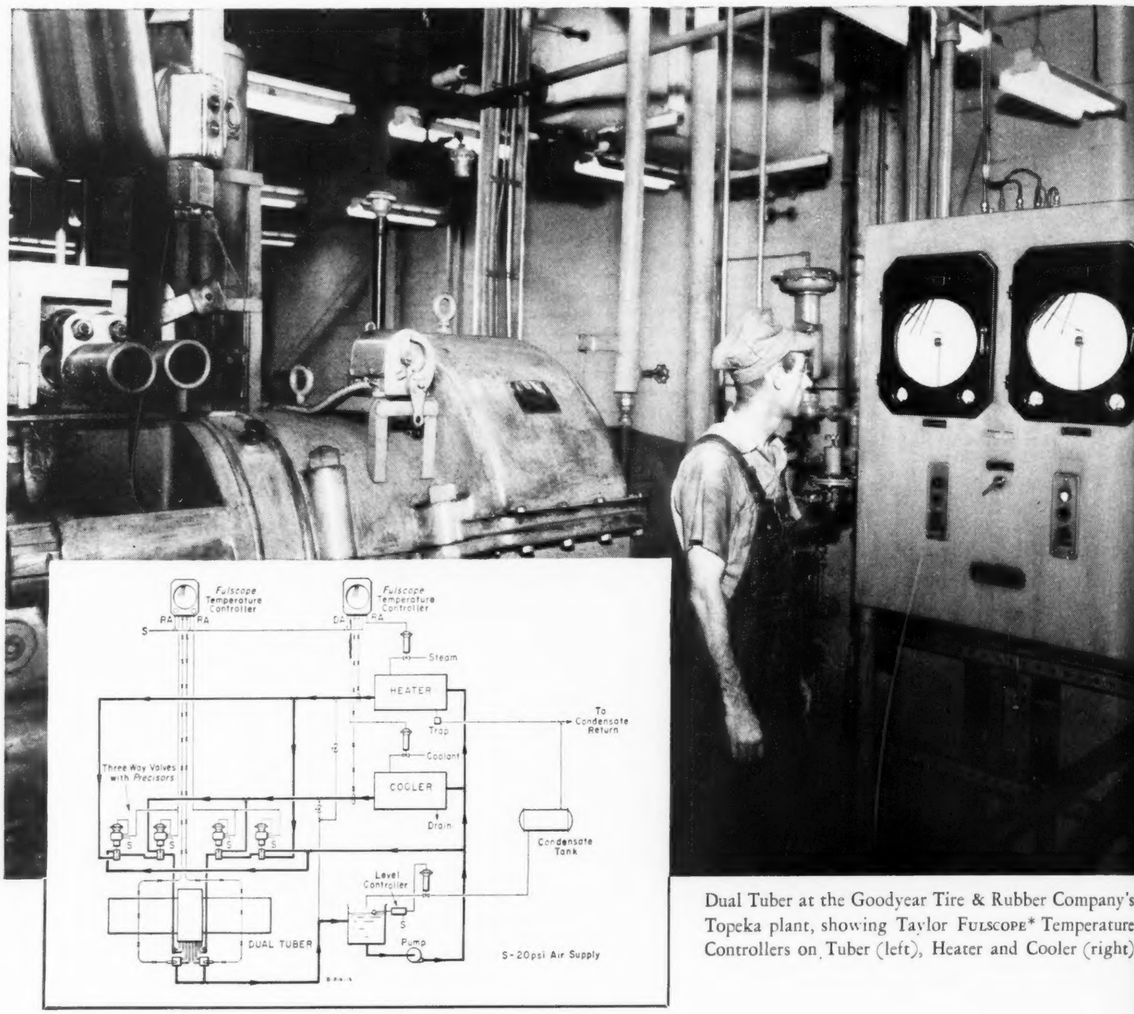
The symmetrical lug tread design gives straight-line traction

(*Continued on page 386*)



U.S. Royal S.R.T. Grip-Matic Tire. Insert is X-ray view of tread





Dual Tuber at the Goodyear Tire & Rubber Company's Topeka plant, showing Taylor FULSCOPE* Temperature Controllers on Tuber (left), Heater and Cooler (right)

GOODYEAR CHOSE *Taylor*

Dual Tuber control system insures a perfectly uniform product regardless of load changes

Of the many methods tried for controlling extruder temperatures, this Taylor system has been proved most satisfactory. It involves circulating a constant volume of liquid at exactly controlled temperatures. For well over a year it has performed with a high degree of accuracy. Whether you're producing tires or mechanical goods, a Taylor control system will help to maintain uniform quality, reduce operating costs and eliminate the hazards of manual operation. Call your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Ontario.

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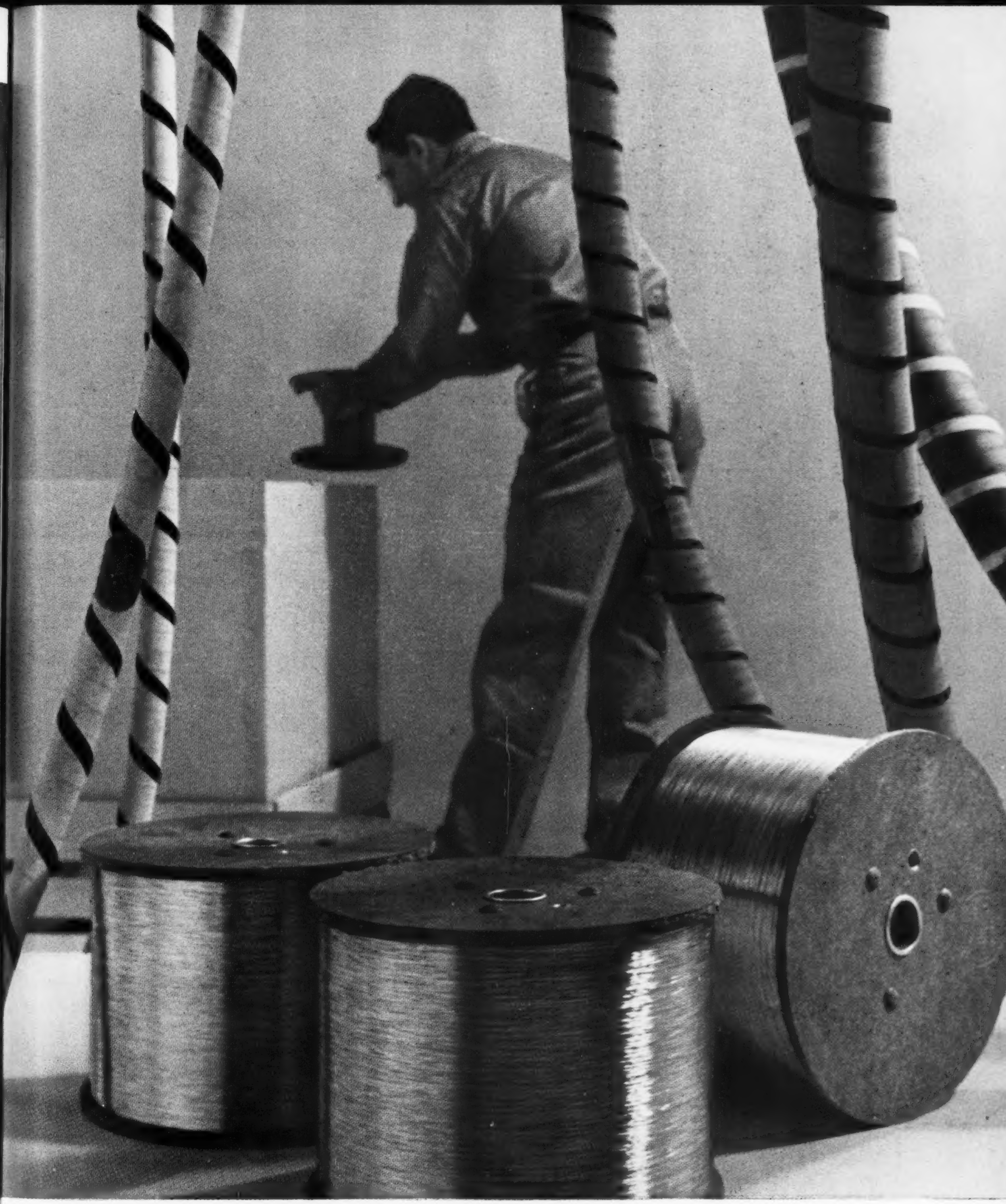

Roebling Hose Reinforcing Wire... The best things come in no-charge packages

When you buy Roebling Hose Reinforcing Wire it is delivered to you on no-charge spools that mean savings to you.

This modern method of packaging does away completely with deposits and the bookkeeping involved; it contributes, too, to lower freight costs. Thus, you avail yourself of a precision-made and quality controlled product, without any handling, shipping and inventory inconveniences.

Roebling Hose Reinforcing Wire, used for braiding reinforcement, is produced in a complete range of sizes. Write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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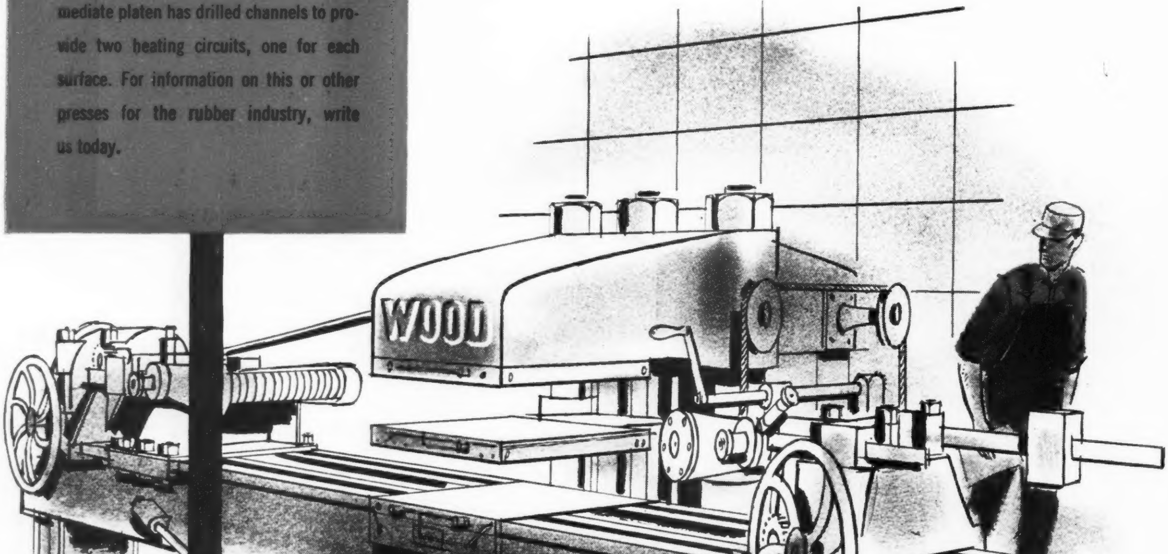
When an R. D. Wood Press swings into action, gratifying things happen to production costs. For, in most cases, production climbs to a new high and downtime for repairs approaches zero. The reason is the smooth, dependable performance of R. D. Wood Presses—even under difficult conditions. And the reasons for this superior performance are the exacting standards set by R. D. Wood—in design, selection of materials, and craftsmanship. If your company's theme is low-cost production, here is your prelude—ready made.

Open Gap 47-Ton Belt Press for curing flat and V-type transmission belts. The moving platen is accurately machined from a rolled steel slab and is guided by long, full-round babbitted guides on the strain rods. Intermediate platen has drilled channels to provide two heating circuits, one for each surface. For information on this or other presses for the rubber industry, write us today.



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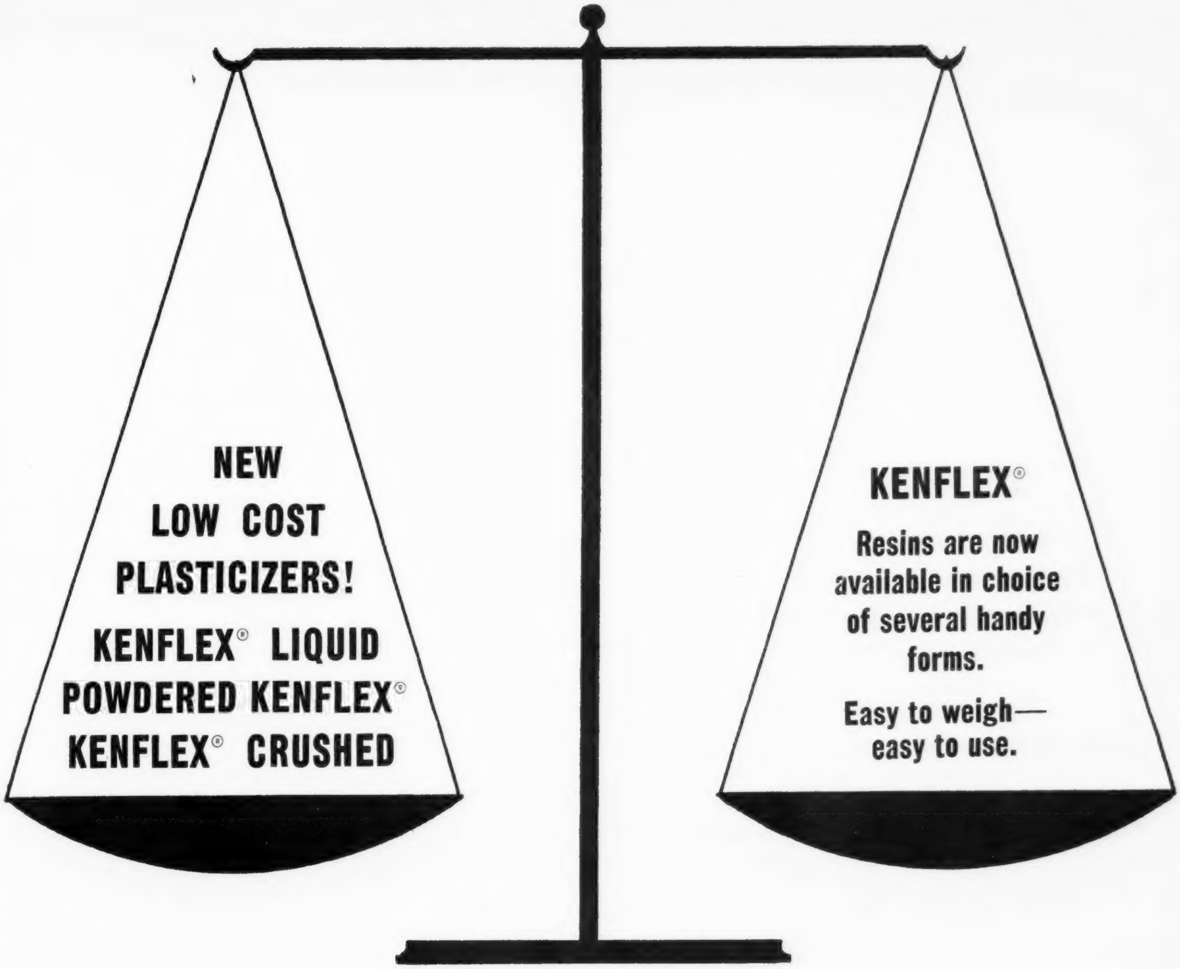

KENFLEX® A Standard in the industry for many years. Improves Electricals. High in wetting power—aids dispersion. Increases plasticity during processing without weakening the product. Speeds extrusion rates and improves molding and surface finish. Improves Neoprene heat-aging.

KENFLEX® A-D Same physicals and electricals as A, but dark.

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Available in a variety of forms to suit your equipment.

SOLID Glassined-Lined cartons or light gage drums.

CRUSHED Prevented from caking by 5% Micro-Cel E.

SPECIAL ORDERS: Crushed forms of KENFLEX® A, KENFLEX® A-D and A-200-D are available with no anti-caking agent or with your own added filler.

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TECHNICAL BOOKS

BOOK REVIEWS

"Effects of Radiation on Materials." Edited by J. J. Harwood, H. H. Hausner, J. G. Morse, and W. G. Rauch. Cloth, 6⁵⁄₁₆ by 9¼ inches: 355 pages. Reinhold Publishing Corp., New York, N. Y. Price, $10.50.

This book is an outgrowth of the technology presented at a radiation effects colloquium held at Johns Hopkins University in March, 1957. The editors have assembled, via cooperating authors each of whom is a recognized authority on his subject, a timely review of the effects of the more commonly encountered types of radiation on solid materials.

Complete coverage of this broad field has been obtained through subdivision of the subject into the following categories, each of which constitutes a chapter in the book: "Defects in Solids and Current Concepts of Radiation Effects," G. J. Dienes; "Experimental Approaches to Radiation Studies — Radiation Sources and Dosimetry," J. C. Wilson; "Radiation Effects on Physical and Metallurgical Properties of Metals and Alloys," E. S. Billington; "Influence of Radiation upon Corrosion Behavior and Surface Properties of Metals and Alloys," M. Simnad; "Effects of Radiation on Electronic and Optical Properties of Inorganic Dielectric Materials," R. Smoluchowski; "Effects of Radiation on Semiconductors," H. Y. Fan and K. Lark-Horovitz; "Cores, Liquid Coolants and Control Rods," C. E. Weber; "Moderators, Shielding and Auxiliary Equipment," G. R. Hennig; "Experimental Techniques and Current Concepts — Organic Substances," M. Burton; and, "Effects of Radiation on Behavior and Properties of Polymers," A. Charlesby. These chapters plus one on the use of radiation for graft polymer production and another which presents an extensive bibliography (779 references) pertinent to the effects of radiation on solids round out the complete volume.

Of direct interest to rubber technologists are three chapters dealing with organic materials, polymers, and graft polymers. While the treatments of each are necessarily brief, they are nevertheless complete and well-documented with literature references. Among the points covered are the following: radical formation, protection of one species in a mixture by the other component, production of polymers, radiation cross-linking, radiation degradation, effects of crystallinity, irradiation of polymers in solution, radiation curing of polyesters, effect of additives, production of surface grafts, and radiation induced matrix grafting.

Although this book is not, by design, an exhaustive treatise on radiation effects, it is a valuable review of the current status of knowledge relating to this subject. It will serve both as a guide to the literature and as a reference source book on radiation effects, as witnessed by the some 676 references cited in the text of the several chapters and the extensive bibliography of 779 references included in the last chapter.

T. C. GREGSON.

"Industrial Fatty Acids and Their Applications." Edited by E. Scott Pattison. Cloth cover, 5⅞ by 9¼ inches. 236 pages. Reinhold Publishing Corp., New York, N. Y., 1959. Price $7.00.

This book covers the production and processing of fatty acids and descriptions of the uses for them. It also emphasizes the practical technology and chemistry involved in the production of fatty acids. This book, moreover, includes a review of the major applications having commercial impor-

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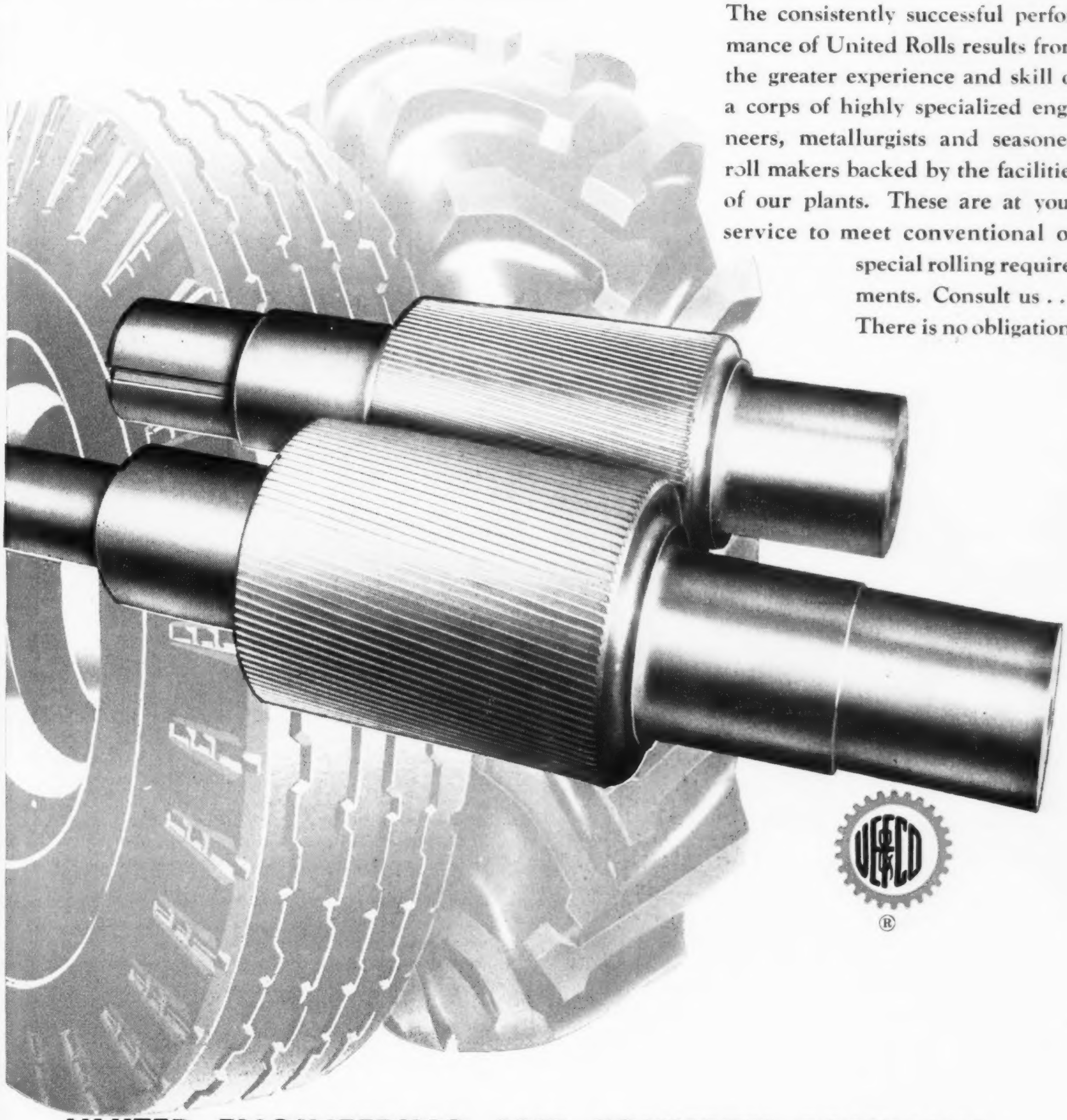

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Technical Books

tance. It provides emphasis to the fact that the industry once considered itself an upgrader of a by-product, but current thinking is more inclined to characterize the industry as supplying specialized industrial chemicals.

The first chapter by Mr. Pattison covers the historical aspects of the field and a little of the nomenclature of these materials which must differentiate between the acids of the chemist and the names given to commercial products. The use of the names stearic and oleic acids in commercial practice is an oversimplification since they are actually mixtures of acids.

The remaining chapters are written by more than 20 experts in the field who have provided the coverage on the more than 50 industries using acids in the manufacture or processes of their own materials. Of special interest to RUBBER WORLD readers would probably be the chapters on the preparation of the acids and the grades available and the handling and testing sections as well as the chapters on the use of fatty acids in the rubber industry and the chapter on polymers and copolymers from vinyl esters of fatty acids. These and several other of the applications would help provide an overall appreciation of these materials which have been of such great importance to the rubber technologist in both synthetic rubber production and in vulcanization.

NEW PUBLICATIONS

Publications of the Office of Technical Services, United States Department of Commerce, Washington, D. C.:

"Evaluation of High-Temperature Hydraulic Seals to Temperature of 550° F.: Part I—Mechanical Evaluation." C. W. Galloway, Douglas Aircraft Co., Inc., for WADC, U. S. Air Force. Order PB 131762. 154 pages. $3.00. This research was conducted to investigate, evaluate and develop seals and packings for use in systems using either OS-45 or MLO-8200 fluids at operating temperatures of 400 and 550° F., respectively. The study included seals of various shapes and forms as well as their method of installation and the materials from which they were manufactured. In general, results showed that two polymers performed with considerable promise at 400° F. At 550° no seals were acceptable, although one polymer exhibited good thermal resistance.

"Design Data for O-Rings and Similar Elastic Seals: Part 3." F. W. Tipton, G. E. Trepus, J. J. Hill, E. L. Schiavon, and C. J. Dezeih, Boeing Airplane Co., for WADC, U. S. Air Force. Order PB 131802. 96 pages. $2.25. In this study, a continuation of previous work, a literature survey on O-rings and seal design was enlarged to include the effects of irradiation and extreme low temperature. Low-temperature tests, relaxation and volume change tests, screening tests, and functional tests were conducted. The functional tests included pulsed annulus tests with various groove configurations and reciprocating shaft tests with and without different types of back-ups at room temperature and at elevated temperatures.

"Development of Thermally Stable Silicon Containing Resins, Part 2." L. W. Breed, F. Baiocchi, and C. C. Bolze, Midwest Research Institute, for WADC, U. S. Air Force. 76 pages. Order PB 131715, $2.00. This work was a continuation of an earlier project aimed at preparation of polyarylene-siloxanes which are thermosetting and which may be used for laminating resins and structural adhesives stable above 500° F. and resistant to degradation by oxygen, ozone, and water. The report is devoted to a discussion of the preparation of laminates from experimental monomers and also presents results of work on synthesis of monomers. These included the use of tetrahydrofuran as a solvent in the Grignard synthesis. Studies were made of the variables effective in the formation of laminates from silicone resins and glass fabric and of the effect of treating finished silicone resins with catalyst solutions.

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Technical Books

"Development of Fluoro-Silicone Elastomers, Part 3." G. W. Dyckes, Peninsular Chemresearch, Inc., for WADC, U. S. Air Force. 63 pages. Order PB 131425, $1.75. Some promising fluoroalkyl silane monomers and polymers were prepared for use as high-temperature and aircraft fuel-resistant elastomeric materials. Hydrolysis reactions were carried out on the monomers, and the constant boiling products were characterized. Polymerization of the cyclic hydrolysis products to elastic homopolymers was realized, using the active metals in Group IA of the periodic table as polymerization catalysts. Copolymers with octamethylcyclotetrasiloxane were also prepared.

"Design Data for O-Rings and Similar Elastic Seals." Order PB 131510. G. E. Trepus, Boeing Airplane Co., for WADC, U. S. Air Force. 114 pages. $3.00. A literature survey on O-rings and seal design was conducted. Commercially available polymers were compounded with various physical properties. Static annulus with varying groove configurations, rotating shaft, and reciprocating shaft functional test jigs was designed and manufactured. Seal tests under various environmental and mechanical conditions were run on these jigs. No definite relation between physical properties and seal efficiency was found. A general relation, however, was evident between seal life and compression modulus and compression relaxation.

"Coordination Polymers, Part 2." W. C. Fernelius, et al. The Pennsylvania State University, for WADC, U. S. Air Force. 71 pages. Order PB 131649, $2.00. A conclusion of this study was that although coordination polymers can be prepared, the problem of getting polymers of truly high molecular weight still remains unsolved. Various attempts were made to polymerize several bis (β-diketones) prepared during earlier research. Polymeric materials were produced from what probably was a mixed ester of a dialcohol and monoalcohol. Other syntheses and reactions are discussed in some detail.

Publications of The British Rubber Producers' Research Association, Welwyn Garden City, Herts, England:

No. 272. **"Surface Films of Polymeric Ethers."** E. G. Cockbain, K. J. Day, and A. I. McMullen. 8 pages. Films of polyoxypropylene diol and a series of polyvinyl alkyl ethers have been obtained at the air-water and decane-water interfaces, and their force area and electrical potential-area characteristics determined. The results are interpreted in terms of the configurations of the polymer molecules at the two interfaces. Graphs and references are provided.

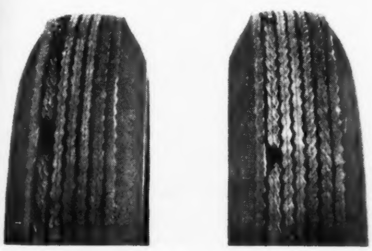
No. 273. **"Polymerization of Admixed Monomers by the Cold Mastication of Rubber."** D. J. Angier, E. D. Farlie, and W. F. Watson. 14 pages. The polymeric free radicals produced by rupture of rubber molecules during cold mastication can be utilized under oxygen-deficient conditions to initiate the polymerization of monomers incorporated in the rubber. A survey of monomers thus polymerized is recorded, and some factors affecting the reaction are illustrated by a more detailed study of methacrylic acid, methyl methacrylate, chloroprene, and styrene. A preliminary survey of the tensile and swelling properties of some masticated products after cross-linking with di-cumyl peroxide gives promise of useful modifications of natural rubber.

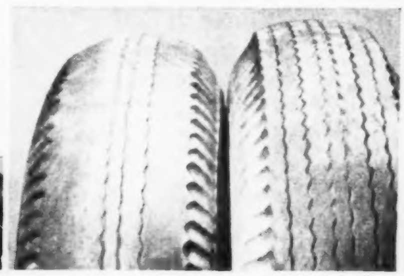
No. 274. **"Influence of Amine Antioxidants upon Light Aging of Rubber Networks."** J. R. Dunn. 8 pages. The degradation in oxygen, under ultra-violet irradiation of wave length of 365 mμ, of peroxide vulcanizates containing various amine antioxidants has been investigated by the method of stress relaxation. Substituted naphthylamines accelerated stress decay, while amines of other classes retarded it; the difference was related to strong absorption of the radiation by the naphthylamines. The methods, results, a discussion, and references are given.

No. 280. **"Friction and Abrasion of Rubber."** By A. Schallamach. 34 pages. Experimental evidence is adduced for the view that rubber friction is similar in character to viscous flow and, therefore, in contrast to solid friction, not necessarily accompanied by abrasion. This theory implies that the forces of rubber friction are proportional to the true area of contact. The true area of contact is determined by elastic deformation of the asperities on the rubber surface, with the result

SELL MORE TIRE POWER

1 **PROVED AT HIGHER THAN TURNPIKE SPEEDS** Laboratory tests had indicated that TYREX viscose tire cord showed superior performance qualities at higher temperatures than nylon. To prove it, an independent tire testing company conducted a series of road tests over a hot, abrasive pavement at speeds up to 128 miles per hour.





60% LESS CHUNK OUT!

2 At these far-greater-than-normal speeds tread chunking naturally occurred. But the number of linear inches of tread chunking on nylon tires was 2½ times as much as on tires made with TYREX viscose cord.

77% LESS GROWTH!

3 The combination of high speed and high temperatures (tire temperatures rose to over 200°) affected the nylon cord more than the TYREX viscose tire cord. The nylon tires showed 3 times as much growth.

24% LONGER TREAD LIFE!

4 At the end of this grueling series of tests, careful measurements of all the tires showed that the tires containing TYREX viscose tire cord delivered 24% greater tread mileage than the tires made with nylon.

Give your customers more tire power with TYREX viscose tire cord—the tough new cord that makes any tire run cooler, softer, quieter and safer . . . with no morning thump.

*TYREX INC., Empire State Bldg., New York 1, N. Y. *TYREX is a certification mark of TYREX Inc., for viscose tire cord and yarn. TYREX viscose tire cord and yarn is also produced and available in Canada.*

that Amontons' law is not obeyed by rubber. The laws of rubber friction are deduced from simple models and satisfactorily confirmed by experiment. Abrasion of rubber is due to mechanical failure under the tractive stresses produced frictionally by the asperities of the track.

"Day Ribbon Blenders." No. 800-159. The J. H. Day Co., division of The Cleveland Automatic Machine Co., Cincinnati, O.

"The Hannifin Valve Finder." Hannifin Co., Des Plaines, Ill.

"Directory of Membership and Services." Association of Consulting Management Engineers, Inc., New York, N. Y.

"Branching Reactions in the Polymerization of Vinyl Acetate"; Degradation Studies on Condensation Polymers"; "Organic Polymers Containing Aluminum and Titanium"; Chemical Resistance and Thermal Stability of Fluorocarbon Elastomer"; "Polymers Derived from Dihydroperfluorobutyl Acrylate"; "The Effects of Gamma Irradiation on Acrylonitrile-Butadiene Copolymers." Office of Technical Services, United States Department of Commerce, Washington, D. C.

"Polyurethane Foam Catalysts." No. B6-R3. Armour Chemical Division, Chicago, Ill.

"Aristocrats of Floors." Rubber and Vinyl Flooring Council, The Rubber Manufacturers Association, Inc., New York, N. Y.

"1959 Fiber Facts." American Viscose Corp., Philadelphia, Pa.

"Fact Book for Selecting and Installing Quad-Ring, O-Ring and Kapseals." Minnesota Rubber Co., Minneapolis, Minn.

"Gyro-Lab Sifters." Sprout-Waldron & Co., Inc., Muncy, Pa.

U.S Royal Tire

(*Continued from page 372*)

and braking action without side drift on inclines and downgrades, and a firm grip on uneven or slick floors, according to the company. This tire is designed for flotation on soft surfaces and is especially suitable for fragile loads.

The Grip-Matic is made with rayon cord in the four sizes most used on materials handling equipment: 6.00/6.90-9; 7.00-12, 7.50-10; and 7.50-15. All are of 10-ply rating except the 7.00-12, which has a 12-ply rating.

Adhesive EX-B150-1

(*Continued from page 346*)

would be the case, for example, in CV cable jacketing operations. Other applications include conveyor belt covers to bodies, wire and cable jackets to insulation, hose covers, roll covers, and multilayer gloves.

When used with a primer, this adhesive bonds rubber stocks to many other substrates such as plastics and metals.

EX-B150-1 is a black mixture of polymeric materials and additives in organic solvents. Some typical properties are reported as follows:

Viscosity	18–22 seconds Zahn #2 Cup @ 70° F.
Total solids	19–21%
Color	black
Solvent	Toluene, dilute as required
Specific gravity	0.94
Density	7.9 pounds per gallon
Flash point	below 80° F.

Complete technical information on Adhesive EX-B150-1 is available from Department 88, Special Products Division, Lord Mfg. Co., Erie, Pa. Evaluation samples are available to interested firms on letterhead request.

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B150-1
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Only McNEIL makes a Practical
Profit-Producing Press for every type of
Tire and Mechanical Goods Production
TIRE PRESSES
Model 900-75-25D
BAG-O-MATIC Tilt-Back
Model 450-55-14D-M-4
BAG-O-MATIC Tilt-Back
Also available with automatic features
Model 230-40-11½
Twin BAG-O-MATIC
with automatic — loading-unloading and post-cure inflation
Model 825-55-14D-M-5
BAG-O-MATIC
MECHANICAL GOODS PRESSES
Model 800-24x48-7
Electrically Heated Platen
Model 800-32
With Ejector
Model 800-32
Intermediate Platen
Model 300
Transfer Molding Press
Model 150
Transfer Molding Press
THE NAME TO REMEMBER FOR PRECISION
McNEIL AKRON
Manufacturers of the World's Finest Rubber Curing Equipment
MANUFACTURING AGENTS: Francis Shaw & Company, Ltd., Manchester, England; Vickers-Ruwolt Proprietary, Ltd., Victoria, Australia; Luigi Pomini, Soc. in Acc. di Luigi e Carlo POMINI fu Egidio e C, Castellanza, Province of Verese, Italy; Etablissements Repiquet, Bobigny (Seine), France; Harburger Eisen Und Bronze-Werke A. G., Hamburg-Harburg, Germany; Kobe Steel Works, Ltd., Kobe, Japan, A B Abjorn Anderson, Svedela, Sweden.
WRITE, WIRE or TELEPHONE TODAY
for complete information
THE McNEIL MACHINE & ENGINEERING CO.
96 E. Crosier St. at Sweitzer Ave. Akron 11, Ohio


PowerGrip "Timing" belts USE
FORTISAN-36...

NEW! HYPALON®

40

- **IMPROVED PROCESSABILITY**
- **IMPROVED PHYSICAL PROPERTIES**

Hypalon 40 synthetic rubber is a new type of chlorosulfonated polyethylene polymer with marked improvement in processing and physical properties.

Hypalon 40 has been thoroughly tested in a number of commercial plants producing wire and cable, hose, coated fabrics, extruded and molded goods and industrial rolls. Processability in these trial runs was excellent.

Hypalon 40 bands quickly on the mill and forms a smooth sheet that holds together and releases easily. It dumps cleanly from Banburys. Banbury dump temperatures may be as low as 180° F. Breakdown or peptizers are not needed.

On factory calenders unsupported films as thin as 2 mils were produced. Extrusions, even of lightly loaded stocks, have low die swell, sharply defined profiles, excellent smoothness and gloss.

Hypalon 40 will not support combustion and has neoprene's resistance to oil and solvents. It retains all of Hypalon 20's resistance to ozone, heat aging and oxidizing chemicals. In addition, it has excellent compression set, elongation, tensile and tear strength properties.

Listed are some of the applications for which Hypalon 40 is a candidate, citing in each case the specific advantages of using Hypalon 40:

BUILDING WIRE, MINE TRAILING CABLE, HEATER CORD, IGNITION WIRE

Hypalon 40 extrudes fast, smooth and glossy. Good colorability and color stability. Good abrasion, tear and tensile. Doesn't heat-soften. Good aging to 325° F. Electricals adequate for one-shot insulation-and-cover in services to 600v.

(A one-shot Hypalon 20 construction was just approved by Underwriters Laboratories for RHW and RHH building wire, and we see no reason why Hypalon 40 should not pass, too.)

GASOLINE HOSE COVER

Resistant to oil and gasoline. Extrudes fast, smooth and glossy. Colorability and color retention. Good tensile, tear and abrasion. Good weathering.

TEXTILE ROLLS

Hypalon 40 may be the all-purpose roll cover—resistant to all the oils and chemicals used in textile processing.

EXTRUDED SEALS (AUTOMOTIVE, ARCHITECTURAL, INDUSTRIAL)

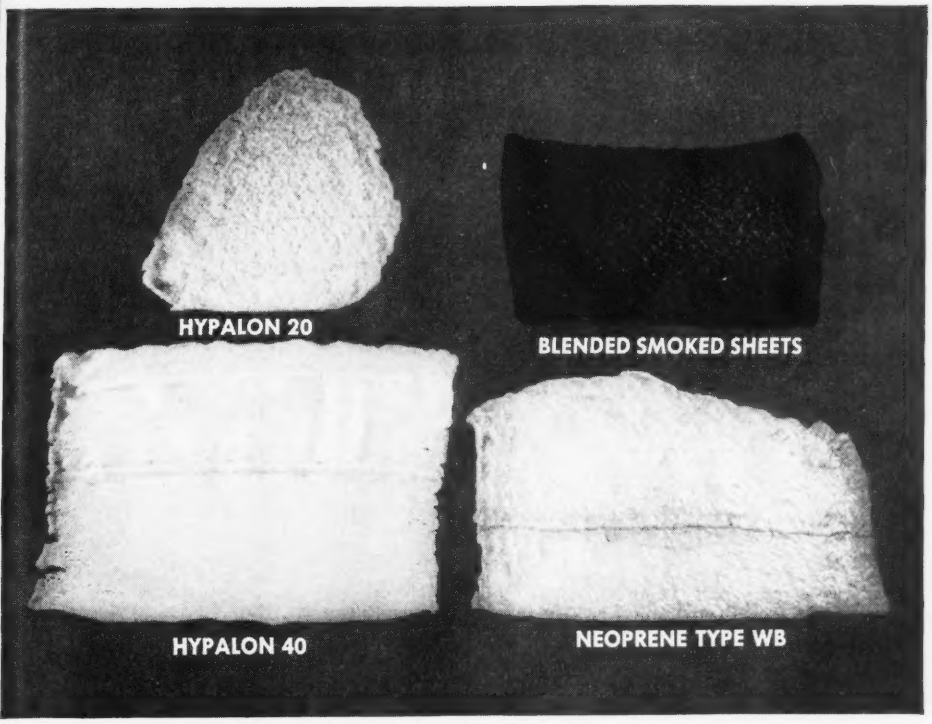
Good extrudability and compression set are important advantages in addition to colorability and resistance to weather, ozone and heat aging.

COATED FABRICS

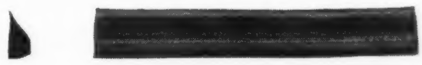
Smooth calendered coatings down to 2 mils thick have been applied on 60-inch factory equipment at normal factory speeds—about 10 yd./min.

AUTOMOTIVE GOODS

Hypalon 40's big asset here is its resistance to the combination: oil, heat and ozone. Colorability, ease of processing and good physicals are added attractions.



Compare appearance of HYPALON 40 with other raw polymer samples of equal weight. These samples were milled 3 minutes at 100° F. roll temperature, removed at 0.050 gage.

LOADING	POLYMER	GARVEY DIE EXTRUSIONS
None	HYPALON 40	
None	HYPALON 20	
SRF Black—35 PHR Oil—8 PHR	HYPALON 40	
SRF Black—35 PHR Oil—8 PHR	HYPALON 20	
SRF Black—75 PHR Oil—8 PHR	HYPALON 40	
SRF Black—75 PHR Oil—8 PHR	HYPALON 20	

Compare the low die swell, the sharply defined profiles, and the excellent smoothness of HYPALON 40 extrusions.

More detailed information on HYPALON *40 is contained in Report 59-2. If you are not on our technical mailing list and would like more information on* HYPALON *40, please write to the Elastomer Chemicals Department, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.*

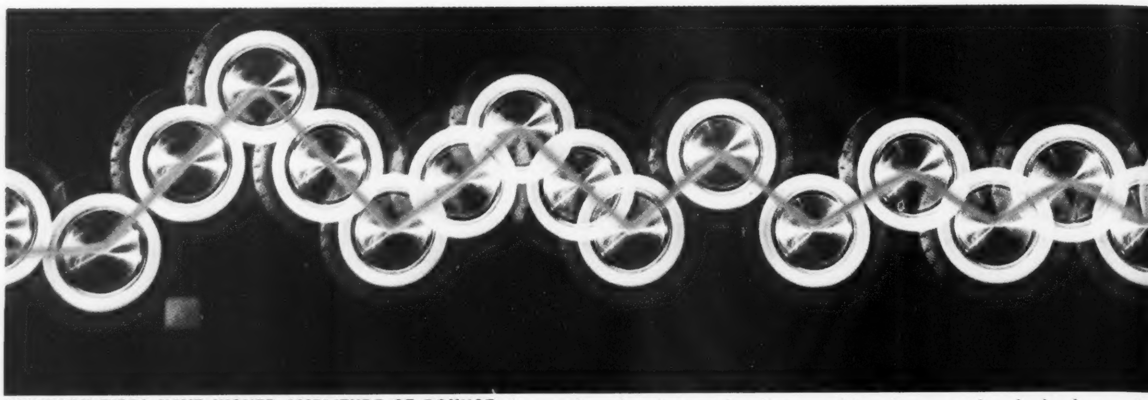
DU PONT
REG. U. S. PAT. OFF.

SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON®
ADIPRENE®

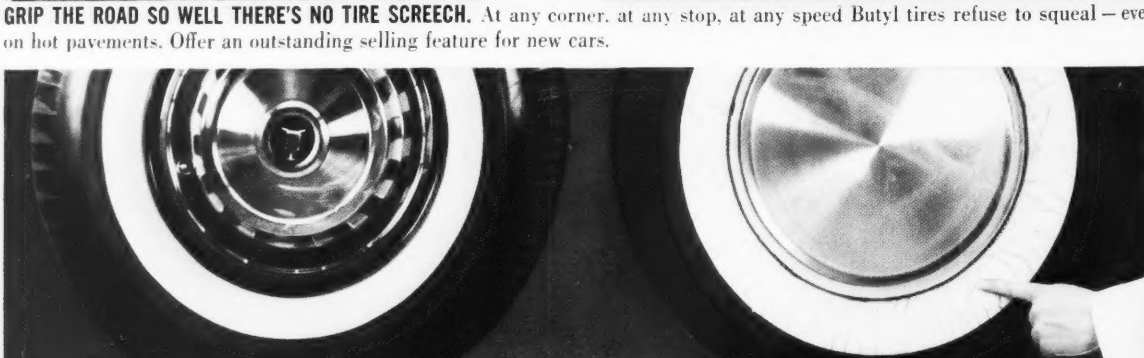
Better Things for Better Living . . . *through Chemistry*

NOW! "SCREECH-FREE" TIRES...



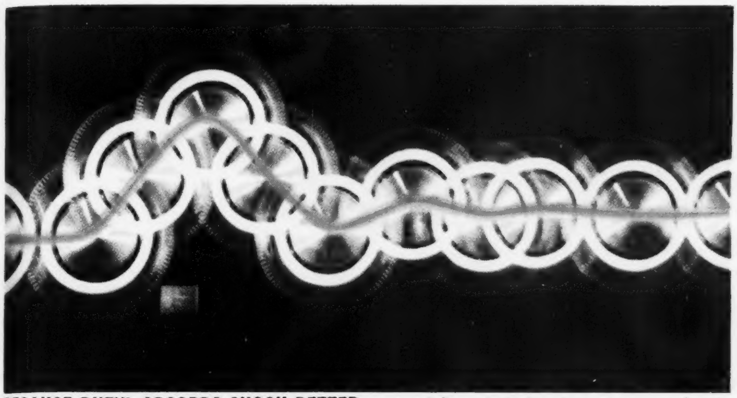
ORDINARY TIRES HAVE HIGHER AMPLITUDE OF BOUNCE. Lower damping factor of ordinary rubber does not absorb shock at point of contact, imposes greater load and wear on suspension system.

GRIP THE ROAD SO WELL THERE'S NO TIRE SCREECH. At any corner, at any stop, at any speed Butyl tires refuse to squeal — even on hot pavements. Offer an outstanding selling feature for new cars.

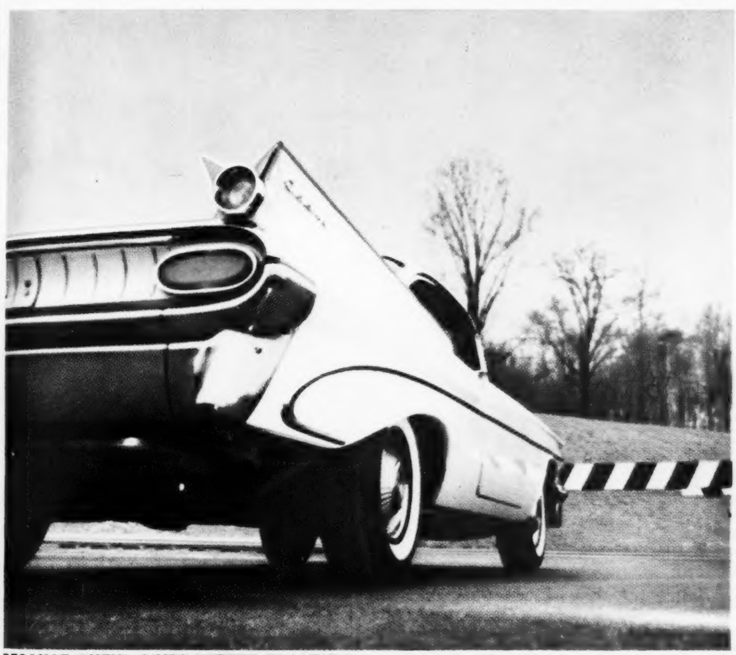


BECAUSE BUTYL RESISTS SUNLIGHT AND OZONE — sidewalls stay smooth, do not crack or craze for the life of the tire. Butyl also offers superior resistance to heat, flexing and tearing.

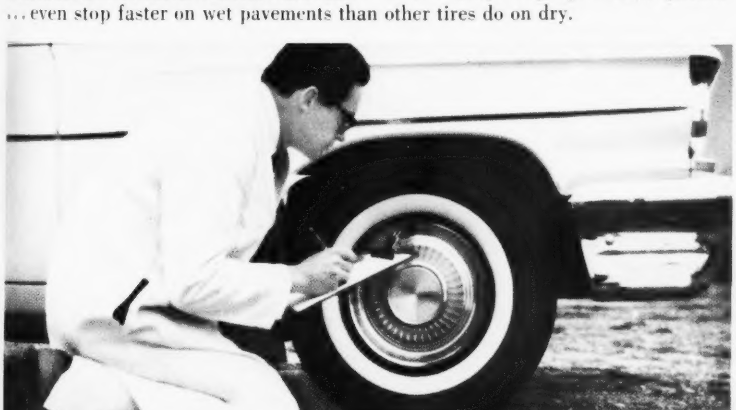
...MADE OF BUTYL RUBBER



BECAUSE BUTYL ABSORBS SHOCK BETTER tires of Butyl glide along – more shock energy is absorbed. Even the thumping sound of road seams is practically eliminated.



BECAUSE BUTYL GIVES BETTER TRACTION – tires of Butyl stop up to 30% quicker ... even stop faster on wet pavements than other tires do on dry.



TESTED FOR MILLIONS OF MILES. Butyl tires have been thoroughly tested everywhere by motorists, technicians and by the military.

REVOLUTIONARY RUBBER OFFERS TIRE MAKERS EVERYWHERE THE OPPORTUNITY OF A LIFETIME

From Enjay comes a new range of Butyl compounds for automotive tires permitting new tread design and tire construction features. These new design ideas and Butyl present an opportunity not often found to come out with a tire of unprecedented silence, shock absorption and traction.

Because Butyl absorbs shock better, tires of Butyl eliminate or at least *minimize the need for structural improvements* to reduce vibration and noise. One set of Butyl tires will literally upgrade the ride of any car . . . making it ride like cars costing much more. So effective is their traction, they *stop up to 30% quicker than other tires.* Because of these unique features, Butyl tires offer *unusual promotional possibilities,* promise to be a big selling point on tomorrow's new cars . . . also offer an equally promising future in the tire replacement market.

Tires of Butyl are now distributed in a major Eastern marketing area. Do you have the *latest* information on the rapid development and consumer acceptance of this remarkable new tire? Contact the Enjay Company for further facts on new test reports, findings of consumer research studies, and other valuable information. We stand ready to provide technical assistance on request.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY® BUTYL

ENJAY COMPANY, INC., *15 West 51st St., New York 19, N. Y., Akron • Boston • Charlotte • Chicago Detroit • Los Angeles • New Orleans • Tulsa*

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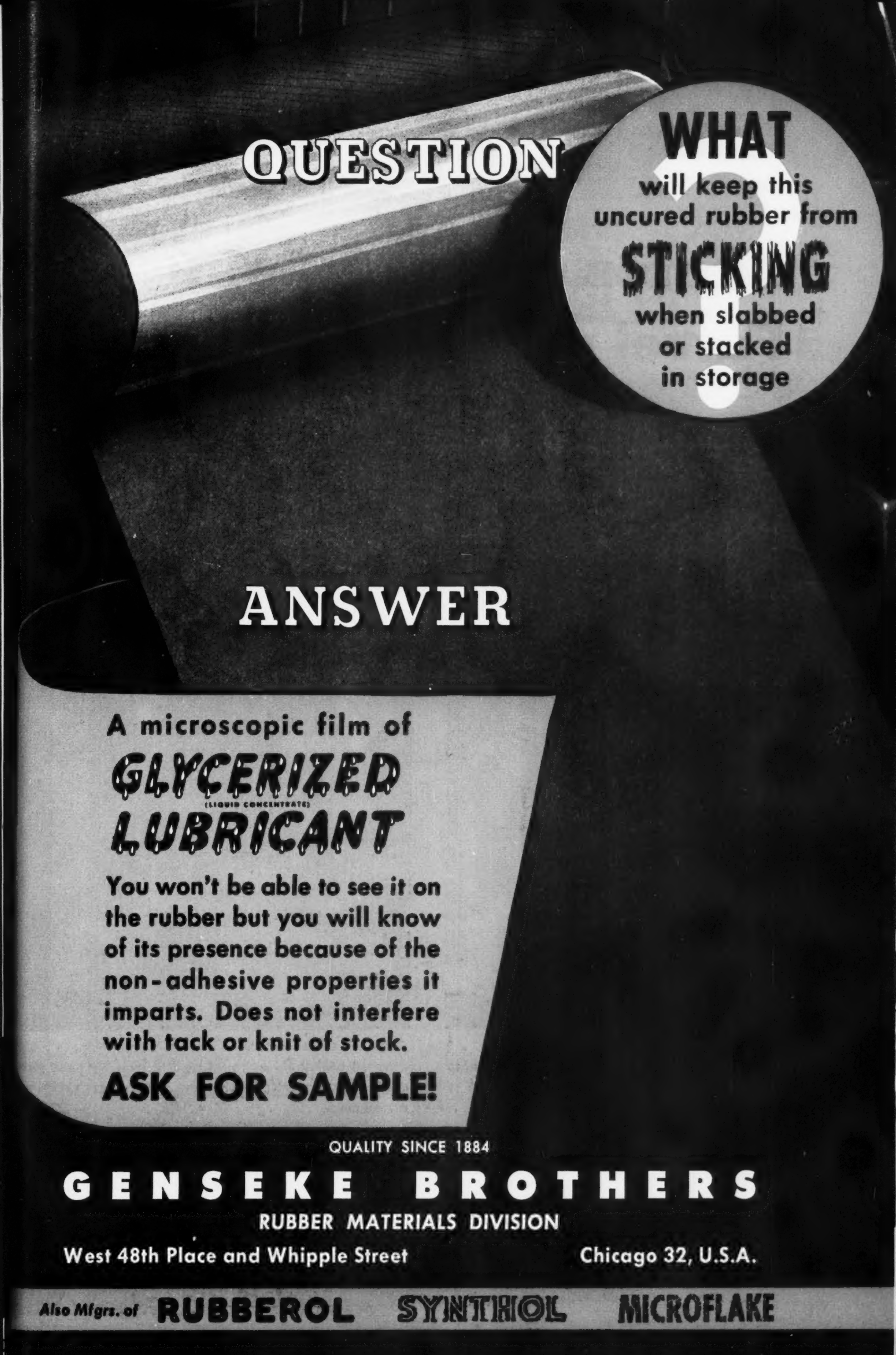
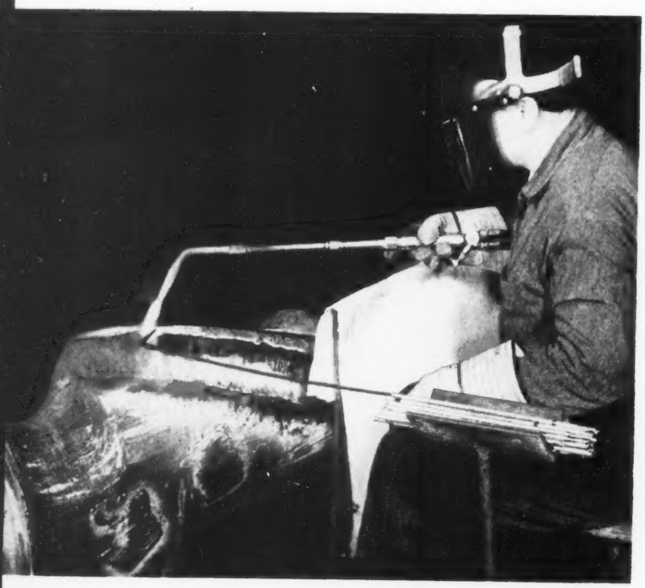
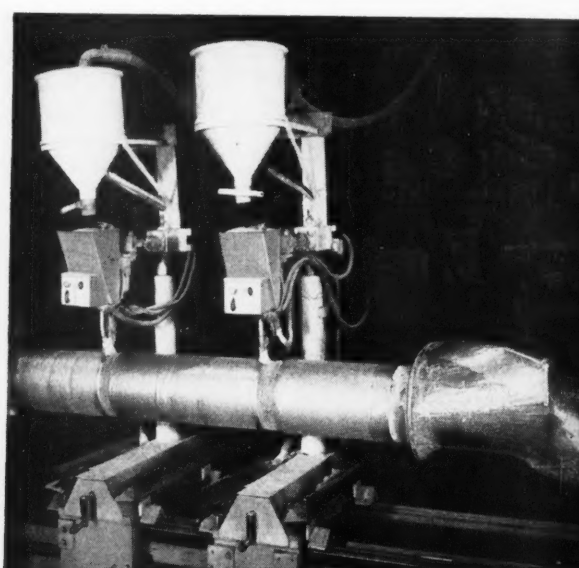

QUESTION
WHAT
will keep this
uncured rubber from
STICKING
when slabbed
or stacked
in storage
ANSWER
A microscopic film of
GLYCERIZED
(LIQUID CONCENTRATE)
LUBRICANT
You won't be able to see it on the rubber but you will know of its presence because of the non-adhesive properties it imparts. Does not interfere with tack or knit of stock.
ASK FOR SAMPLE!
QUALITY SINCE 1884
GENSEKE BROTHERS
RUBBER MATERIALS DIVISION
West 48th Place and Whipple Street
Chicago 32, U.S.A.
Also Mfgrs. of
RUBBEROL
SYNTHOL
MICROFLAKE

Photos show you why Farrel rebuilding assures

NEW BANBURY®



The body of the rotor is built up to its full original size. In this photograph, the finest-grade Stellite is being applied to a blade by oxyacetylene process.



Automatic setup for applying steel to build up rotor journals so they can be machined to original size. Process is submerged-arc welding.

Rebuilt rotor, completely restored to original working efficiency.

For an idea of the thorough approach to Banbury® mixer rebuilding at Farrel, note the illustrations below. They cover four important stages of rotor rebuilding. In all, these critical parts are rebuilt in a sequence of 42 separate operations, including three nondestructive tests for soundness. Result: rotors that are just as good as new and, in fact, carry the same guarantee. The rebuilding of other components is handled with similar thoroughness.

In rebuilding Banbury mixers, there is no substitute for Farrel's experience and facilities. The company has the knowledge of all improvements in design that can be applied with advantage to your repair job; also the special equipment required to do the job correctly.

When your Banbury mixer needs rebuilding, make sure you get the kind of job that will give you new machine performance. Call the Farrel office nearest you.

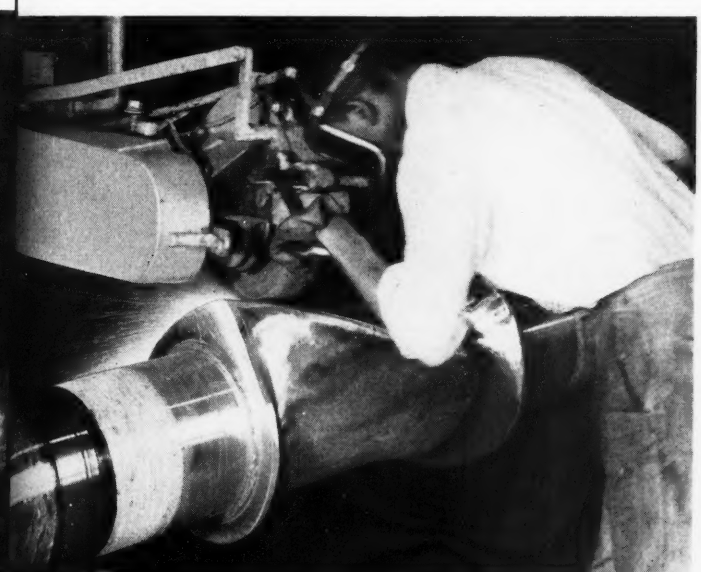
FARREL-BIRMINGHAM COMPANY, INC.

Ansonia, Conn., (REgent 4-3331)
Buffalo 5, N. Y., P.O. Box 2071 (BEdford 3440)
Akron 3, Ohio, 665 West Market St. (POrtage 2-8871)
Ann Arbor, Mich., 1906 Winsted Blvd. (NOrmandy 2-5978)
Chicago 43, Ill., 10725 South Western Ave (PRescott 9-3421)
Los Angeles 21, Calif., 2032 Sante Fe Ave. (LUdlow 5-3017)
Houston 2, Texas, 860A M & M Building (CApitol 2-6242)
Atlanta 8, Ga., 710 Peachtree St. N.E. (TRinity 6-1352)

FARREL®

FB-1170

Y® PERFORMANCE



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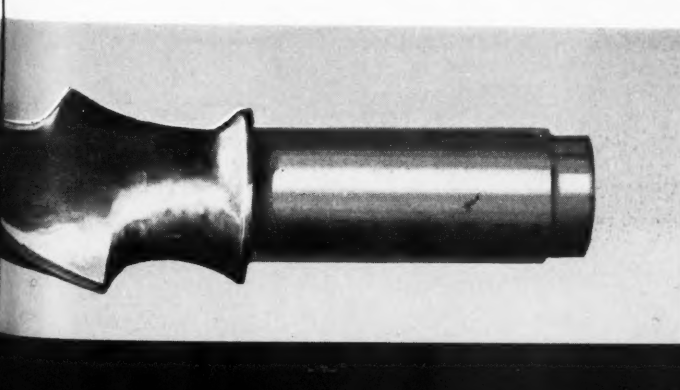
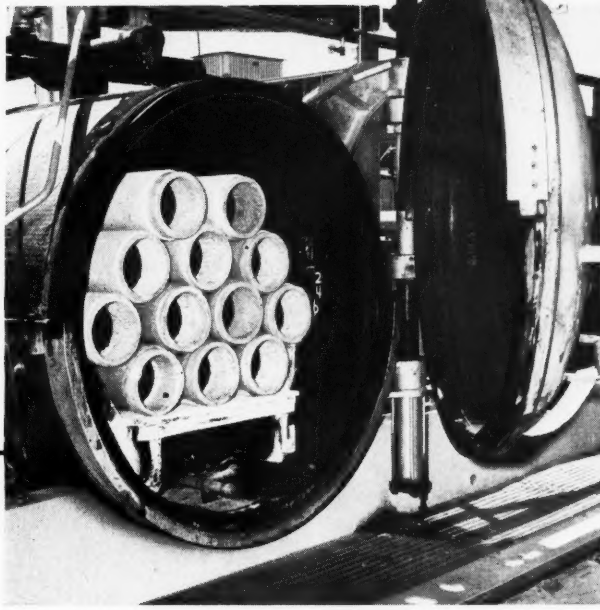
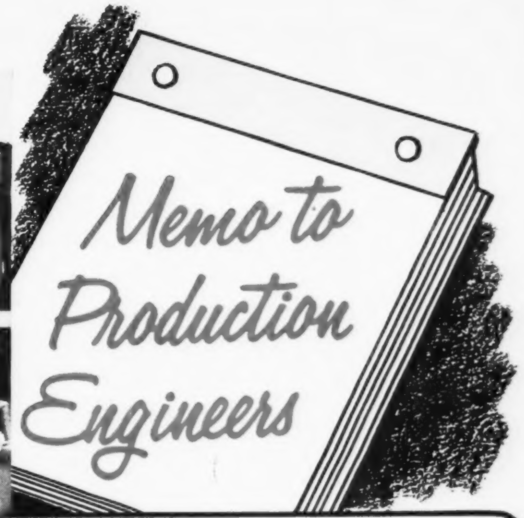
Here the rotor shape is being restored through swing grinding. Original blueprints guide Farrel craftsmen at every stage of rebuilding.

Final polishing of the Banbury rotor body is done with a motorized emery belt.



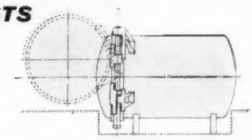




◀ Adamson 90″ dia. Hi-Lift Swing Door installed at Johns-Manville Products Corporation, Manville, N. J. One of many Adamson doors now in operation, or on order, for use in steam-curing TRANSITE® Pipe at J-M Plants in the U. S. and Canada.

Here are 6 important reasons why you should specify ADAMSON UNITED Hi-Lift Swing Vulcanizer & Autoclave Doors

1 LOWER INSTALLATION AND OPERATING COSTS



Adamson's lift-swing feature eliminates need for extended pit and expensive bridging. For example, on a 90″ dia. door you can use an easily-handled loading bridge as short as 22″.

2 TIGHT, LEAKPROOF SEAL

Adamson's special heat-resistant, self-sealing gasket utilizes vessel's internal pressure to assure a positive, leakproof seal.

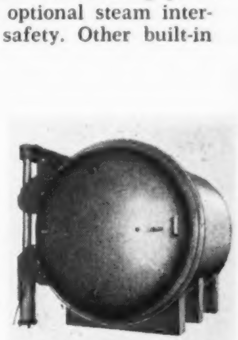
3 EFFICIENT SLIDE-LOCK DESIGN

Provides virtually 360° of locking surface between door and mating shell ring. *Twice* the locking area of conventional breech-lock doors!

4 SAFE, RELIABLE OPERATION

Equipped with automatic door locking pins. Can be furnished with optional steam interlock controls for complete safety. Other built-in safety features included.

5 STRONGER CONSTRUCTION



Conventional castings are replaced by sturdy pressed steel head welded to continuous roll forged locking rings.

6 FAST OPENING AND CLOSING

Quick-unlocking, vertical-lift action powered by hydraulic cylinder. Door swings easily on anti-friction and bronze sleeve bearings. Simple, trouble-free operation.

7067

ADAMSON UNITED
COMPANY

730 CARROLL STREET, AKRON 4, OHIO

Subsidiary of United Engineering and Foundry Company
Plants at Pittsburgh, Vandergrift, Wilmington, Youngstown, Canton

We offer a wide range of door sizes and pressures, available as integral equipment on vessels supplied by us, or as separate units for mounting on tanks made by other manufacturers. Write for catalog No. 562.

DESIGNERS AND BUILDERS OF BASIC MACHINERY AND EQUIPMENT FOR COMPLETE PROCESSES

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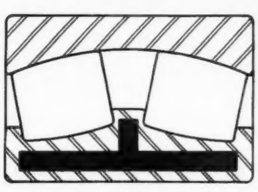
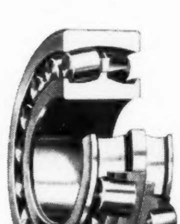
ORLD



Basic "T" section design shows "backbone" construction that insures positive roller guidance and stability without skewing under all load conditions.



For roller stability...

there's nothing like "the bearing with the backbone"

The only *positive* way to guide rollers is by an integral center guide flange—backbone of the *Torrington* Spherical Roller Bearing. No floating ring can match it for stability under heavy radial and thrust loads.

This "bearing with the backbone" insures true rolling motion . . . prevents stress concentration . . . means minimum friction. It makes possible open-end cage design, too, with no shrouds to impede circulation of lubricant to bearing contact surfaces. There is less heating and more positive lubrication.

The integral center guide flange is adapted from the same principle used in the design of Torrington Tapered Roller Bearings. This refinement is typical of Torrington's uncompromising engineering that assures you the ultimate in bearing performance. **The Torrington Company, South Bend 21, Ind.—and Torrington, Conn.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • NEEDLE • BALL • NEEDLE ROLLERS • THRUST

Gentro-

SELECT FROM THIS VARIETY OF COMMERCIALLY-AVAILABLE *Gentro-Jet* BLACK MASTERBATCHES

Gentro-Jet	RUBBER		PROCESS OIL		CARBON BLACK	
NUMBER	PARTS	TYPE	PARTS	TYPE	PARTS	TYPE
9152	100	1500	5	HA	40	SAF
9153	100	1500	10	HA	52	HAF
9154	100	1500	12.5	HA	52	ISAF
9199	100	1500	—	—	50	HAF
9250	137.5	1712	7.5	HA	70	ISAF
9251	137.5	1712	—	—	60	ISAF
9252	137.5	1712	7.5	HA	55	SAF
9275	137.5	1712	7.5	HA	75	HAF
9299	125.0	1706	—	—	50	HAF

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AROMEX ISAF
AROMEX HAF
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ARROW MPC
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HUBER

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For rubber reinforcing pigments, think of HUBER

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Carbon Blacks • Clays • Rubber Chemicals

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ORLD

RUBBER WORLD
EDITORIAL

What Is a Rubber and/or an Elastomer?

NEW and more quantitative definitions for "rubber" and "rubber-like" materials have been subjects for an increasing amount of discussion in some quarters of the rubber industry during the past two years. Present-day international and domestic commerce requires these new definitions in order to eliminate costly confusion in separating these materials from those loosely termed as "plastics."

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials has prepared several proposed definitions for rubber and for rubber-like materials, but none of them has been accepted unanimously by its members. New definitions have been considered by the Division of Rubber Chemistry of the American Chemical Society and various government bureaus also.

In the course of these discussions, the word "elastomer" is inevitably introduced. This term was proposed prior to World War II by Harry L. Fisher, a past president of the ACS, and a past chairman of its Rubber Division, to designate all substances having the properties of natural, reclaimed, or synthetic rubber. Obviously the word is a condensation of "elastic" and "polymer."

Development of hundreds of new elastic polymers during the past 15-20 years, some with properties more rubber-like than others, has led to the use by some persons of the term elastomer to designate all of these materials; while others consider only natural rubber and the better known synthetic rubbers as elastomers.

The urgency of the need of an adequate means of differentiating between rubber, rubber-like, or flexible plastic materials is therefore quite evident. Are they all elastomers, or are only rubbers to be called elastomers? If they are all elastomers, by what means can they be separated quantitatively from other high polymeric materials?

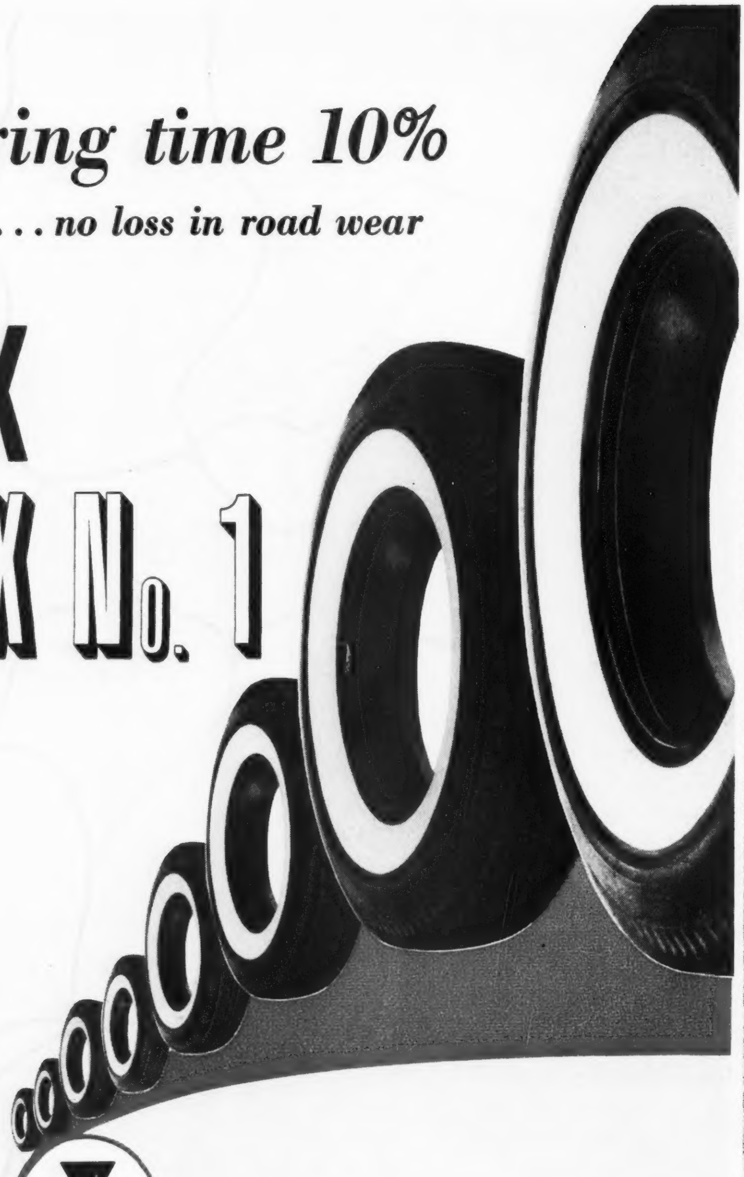
Arbitrary limits of extensibility and/or compressibility and subsequent retraction of a vulcanized or cross-linked material has been suggested as a means of classifying rubbers, but this approach will require a lot of data from which the limits can be selected. Elastic properties at room temperature may vary considerably between rubbers since some are designed for elastic properties at high or low temperatures with less regard for these properties at room temperature, for example.

Is it necessary to separate rubber-like materials from flexible plastics, or may these two types be classed as one? Is minimum extensibility at room temperature the only property necessary for identifying rubber-like and/or flexible plastic materials, and, if so, does this then comprise the definition for elastomers?

These are only some of the questions to be answered before adequate definitions can be developed, but they concern all technologists in the industry. The ASTM D-11 subcommittee 8 on nomenclature and definitions meets again on June 24 and will welcome any and all suggestions in connection with quantitative definitions for rubber and elastomer prior to or after this meeting. Please address comments to the editor of RUBBER WORLD.

R. G. Seaman

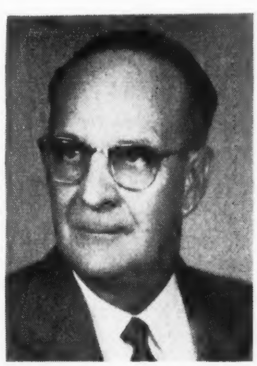
EDITOR



RUBBER WORLD

Available Dry Styrene-Butadiene Rubbers (SBR)—United States and Canada

By R. G. SEAMAN and C. A. CARLTON
RUBBER WORLD, *New York, N. Y., J. M. Huber Corp., Borger, Tex.*



Conway Studios
Robert G. Seaman

C. A. Carlton

IT WAS pointed out in an editorial in the December, 1958, issue of RUBBER WORLD that the situation which had developed in the marketing of styrene-butadiene rubber (SBR) in 1958 could result in a disservice not only to the producers themselves, but to their customers. The difficulties involved the systems of designating the various grades and types of SBR and the limited amount of information provided the consumer on the composition and properties of many of the newer grades. By types we mean hot polymerized, cold polymerized, oil-extended, or masterbatched with carbon black with or without oil. By grades we mean the designations by the several producers for rubbers made of one or more types.

SBR Numbering Systems

At this point it is necessary to explain for the record how the systems of designating SBR types and grades came about, and why some confusion has resulted in the recent past from their use. During the period of production of styrene-butadiene rubber by the government, that is from 1943 until 1955 when the producing plants were sold to private industry, a broad system of standardization and designation of types and grades was developed. The American Society for Testing Materials and its Committee D-11 on Rubber realized in early 1955 that some organization should be available to carry on whatever standardizing activities might be necessary and desirable under private operation of these synthetic rubber plants. Subcommittee 13 on Synthetic Elastomers of Committee D-11 was formed for this purpose.

Under the Government Synthetic Rubber Program the various types of dry SBR, or GR-S as it was called at that time, were coded with four digit numbers as follows:

Hot Polymerized, Unpigmented Polymers	1000–1099
Hot Polymerized, Pigmented Polymers	1100–1199
Cold Polymerized, Unpigmented Polymers	1500–1599
Cold Polymerized, Pigmented Polymers	1600–1699
Cold Polymerized, Oil-Extended Polymers	1700–1799
Cold Polymerized, Oil-Extended, Pigmented Polymers	1800–1899

In mid-1956, ASTM approved D 1419-56T, Tentative Recommended Practice for Description of Types of Styrene-Butadiene Rubbers, in which in Table II, "the more important synthetic rubber produced commercially as GR-S types in the Government Synthetic Rubber Program" were listed according to "the original designations assigned by the Office of Rubber Reserve, R. F. C. It is intended that these type numbers shall continue to be used to describe rubbers of the same

types now produced in privately owned plants," it was added.

The use of these former GR-S numbers for the established commercial grades was continued by the private producers.

Under the government program, newly developed SBR's were designated by X and a three-digit number, such as X-633. When and if this grade achieved sufficient volume of use to be considered commercial, it was assigned a regular four-digit number and became GR-S 1016 or GR-S 1604, depending on the type.

Table I in ASTM D 1419 gives a list of the 12 American and Canadian SBR producers and a range of code numbers for each. These numbers may be used to designate new rubbers that do not conform to the types in Table II, and any rubber designated by a code number in Table I should be assigned a new number by applying to the ASTM D-11 subcommittee 13 when one or more producers decide that the rubber has achieved commercial acceptance. The groups of 500 numbers for newly developed rubbers were assigned to the various producers as follows:

American Synthetic Rubber Corp.	3000-3499
Copolymer Rubber & Chemical Corp.	3500-3999
Firestone Synthetic Rubber & Latex Co.	4000-4499
Goodrich-Gulf Chemicals, Inc.	4500-4999
Goodyear Tire & Rubber Co.	5000-5499
Naugatuck Chemical Division, United States Rubber Co.	6000-6499
Phillips Chemical Co.	6500-6999
Polymer Corp., Ltd.	7000-7499
Shell Chemical Corp.	7500-7999
Texas-U. S. Chemical Co.	8000-8499
United Rubber & Chemical Co.	8500-8999
General Tire & Rubber Co.	9000-9499

It was suggested that the range of 500 numbers assigned to each producer be further divided by product type as follows:

Producer's Code No.	Product Type
0 to 49	Hot Polymerized, Unpigmented Polymers
50 to 99	Hot Polymerized, Pigmented Polymers
100 to 149	Cold Polymerized, Unpigmented Polymers
150 to 199	Cold Polymerized, Pigmented Polymers
200 to 249	Cold Polymerized, Oil-Extended Polymers
250 to 299	Cold Polymerized, Oil-Extended, Pigmented Polymers

Thus, a hot polymerized, unpigmented rubber of American Synthetic Rubber Corp. should be numbered between 3000 and 3049; a cold polymerized, carbon black masterbatch of Copolymer Rubber & Chemical should be numbered between 3650 and 3699; a cold polymerized, oil-extended rubber of Goodyear Tire & Rubber Co. between 5200 and 5249.

The advantage of this ASTM system is that each producer has a distinctive series of numbers for his newly developed rubbers; while at the same time consumers can tell from these numbers alone not only the producer, but type, if each producer numbers his grade correctly.

Most of the SBR producers are following the ASTM D 1419 Table I system, but a few have decided to use their own special coding. The disadvantages of these special codings is that they do not identify the new rubbers by types, one number used by one producer may be the same or very close to a number used by another producer while the type is entirely different, and the total of all the numbers is much greater. Among the complaints voiced by some producers with regard to the ASTM D 1419 Table I system for new rubbers is that there are not enough numbers available for all the new rubbers that may be developed. Maybe some of the minor variations are not really new rubbers and should not have entirely different numbers. Also, when the new rubber is used in good volume, it should be given a number in the Table II group, and this would release the Table I number for use again.

Need for New Tabulation

Although Rubber World has carried on a campaign for almost a year to encourage these producers to use the ASTM D 1419 Table I system for new SBR's, it was decided that it would be a distinct service to the industry to try and collect the necessary information on all grades, no matter how they were identified, and prepare a table for publication for the benefit of all concerned. In an editorial in our March issue, we made another appeal to the SBR producers to review their lists and let us have all the information they could for this purpose.

Following our December, 1958, editorial, C. A. Carlton, technical director, J. M. Huber Corp., who had been working for some time on collecting all the available information on not only SBR hydrocarbons and latices, but all synthetic rubbers, offered to make available to Rubber World all or any part of his information to help us complete our project. His offer was accepted and has been of tremendous help in preparing our final tabulation. In fact, without his information and cooperation as well as that of the SBR producers the table listing all known SBR's now used commercially would not have been possible in any reasonable length of time.

Table Details

The table of "Available Dry Styrene-Butadiene Rubbers (SBR)—United States and Canada," as presented here, lists about 150 different grades and is divided into the types as defined in ASTM D 1419. About one-third of the grades have Table II numbers; one-third have Table I numbers; and one-third are specially coded. An accompanying table lists the abbreviations used to designate the various producers, the different stabilizers, emulsifiers, coagulation means, carbon black and oil types. Footnotes to the main table explain variations in methods of reporting such things as Mooney viscosity, oil content, etc., as used by different producers.

Brief descriptions have been included in the main table for each grade to highlight composition variations, similarity of composition between some grades, and special characteristics or suggested product applications where these facts could be determined.

An addition to the ASTM D 1419 in connection

Available Dry Styrene-Butadiene Rubbers

An attempt has been made to assemble in the table accompanying this article as much information as possible on currently available styrene-butadiene (SBR) rubbers as a service to consumers and producers alike.

Since mid-1956, the American Society for Testing Materials through subcommittee 13 on Synthetic Elastomers of Committee D-11 on Rubber has been publishing information on SBR's of the 1000 to 1899 series, but new rubbers of the 3000-9499 series have not had regular publication in the trade journals and elsewhere. In addition, since some producers did not use the ASTM system for new rubbers, individually numbered grades were also on the market.

RUBBER WORLD began to assemble information on dry SBR's in January. It soon learned of a similar effort by C. A. Carlton, of J. M. Huber Corp. By combining our efforts and by virtue of the cooperation received from SBR producers, quite a complete tabulation has been developed. We think it will be of value to the entire rubber industry. We will welcome comments and suggestions for its improvement.

TABLE 1A. ABBREVIATIONS FOR STYRENE-BUTADIENE RUBBER TABULATION

Abbrev.	Description
A	Aromatic Oil
AL	Alum
Amt	Amount
AS	AMERICAN SYNTHETIC RUBBER
Bu	Butadiene
BAL	Brine-Alum
Bd.Sty.	Bound Styrene
Coag.	Coagulant
CR	COPOLYMER RUBBER & CHEMICAL
Emul	Emulsifier
EPC	Easy Processing Channel Black
FA	Fatty Acid Soap
FEF	Fast Extruding Furnace Black
FS	FIRESTONE SYNTHETIC RUBBER & LATEX
G	GENERAL TIRE & RUBBER
GA	Glue-Acid
GG	GOODRICH-GULF CHEMICALS
GT	GOODYEAR TIRE & RUBBER
HA	Highly Aromatic Oil
HAF	High Abrasion Furnace Black
HPO	Heavy Processing Oil
ISAF	Intermediate Super Abrasion Furnace Black
MT	Medium Thermal Furnace Black
MV	Mooney Viscosity. ML-4' @ 212° F. When underscored = MV on compounded stock
N	Naphthenic Oil
N-NS	Naphthenic Oil-Non-Staining
NC	NAUGATUCK CHEMICAL
NS	Non-Staining
PC	PHILLIPS CHEMICAL
PO	POLYMER CORP., LTD.
RA	Rosin Acid Soap
Sty.	Styrene
SA	Salt-Acid
SBR	Styrene-Butadiene Rubber (ASTM Designation)
SC	SHELL CHEMICAL
Spec.	Special
SRF	Semi-Reinforcing Furnace Black
SS	Slightly staining
ST	Staining
Stab.	Stabilizer
TU	TEXAS-U. S. CHEMICAL
UR	UNITED RUBBER & CHEMICAL

TABLE 1B. PRODUCERS' TRADE NAMES

Prod. Abbrev.	Trade Names
AS	ASRC
CR	Copo, Carbomix
FS	FR-S
G	Gentro, Gentro-Jet
GG	Ameripol
GT	Plioflex
NC	Naugapol
PC	Philprene
PO	Polysar, Krylene, Krynol
SC	S
TU	Synpol
UR	Baytown

with the classification of numbers for carbon black masterbatches and carbon black-oil masterbatches that has not yet been actually incorporated in the method, as printed, is used in this tabulation. It specifies that with 14 or less parts of oil per 100 SBR, the number used should be that assigned for a hot or cold polymerized black masterbatch, and when 15 or more parts of oil per 100 of SBR are used, the number should be that for the oil-black masterbatches. This action was necessitated by the practice of using small amounts of processing oil with certain black masterbatches, but which oil could not be considered as an extender. All of this information has been approved by the producers involved, before publication.

We have had to limit this tabulation to dry SBR's because of space considerations. With the further cooperation of the producers, we hope to prepare similar tables for SBR latices and high styrene SBR's since much of this work has already been done by Mr. Carlton. The present table of dry SBR's will not answer the needs of all users, but we feel that it is a worthwhile contribution, and we will welcome suggestions for its improvement.

TABLE 2. AVAILABLE DRY STYRENE-BUTADIENE RUBBERS (SBR) — UNITED STATES AND CANADA

ASTM No. or Other	MV[1]	Stab.[2]	Emul.[2]	Coag.[2]	Black[2] Type	Black[2] Amt.	Oil[2] Type	Oil[2] Amt.	Producers[2]	Description[3]
					HOT POLYMERIZED TYPES					
1000	44–52	ST	FA	SA	—	—	—	—	FS, GG, PC, SC, TU	Gen.-purpose staining-type hot rubber
Polysar S	47	ST	FA	—	—	—	—	—	PO	Essentially same as 1000
1001	44–52	SS	FA	SA	—	—	—	—	FS, GG, PC, TU	Less staining than 1000
1002	50–58	ST	RA	SA	—	—	—	—	GG, SC, TU	Same as 1000 except rosin instead of fatty acid soap
1004	46–54	ST	FA	AL	—	—	—	—	AS, FS	1000 coagulated with alum for low water absorption
1006	46–54[4]	NS	FA	SA	—	—	—	—	AS, CR, FS, GG, GT, PC, SC, TU	Non-staining, non-discoloring version of 1000
Polysar S-630	47	NS	FA	—	—	—	—	—	PO	Equivalent to 1006
1007	45–55	ST	FA	GA	—	—	—	—	FS, GG, TU	Glue-acid coagulated 1000 for low water solubles
1009	115-135	NS	FA	SA	—	—	—	—	AS, FS, GG, PC, SC, TU	Terpolymer of Bu., Sty., Divinylbenzene. Low shrinkage and swell
Polysar S-X 371	—	NS	FA	—	—	—	—	—	PO	Equivalent to 1009
1010	25–35	NS	FA	AL	—	—	—	—	FS, PC	Low Mooney viscosity for chemically blown sponge and adhesives
1011	50–58	NS	RA	SA	—	—	—	—	GG, SC	1006 with rosin instead of fatty acid soap
1012	95–115	NS	FA	SA	—	—	—	—	FS, GG, TU	High Mooney viscosity 1006 for high-viscosity cements
1013	40–50	NS	FA	AL	—	—	—	—	FS, GG, SC	Alum coagulated, 43% Bd.-Sty., low water solubles
1014	55–85	SS	RA	BAL	—	—	—	—	FS	Good tack and green tensile for adhesives. 40% Bd.Sty.
1016	46–54	ST	FA	GA	—	—	—	—	NC	Glue-acid coagulated for low water absorption
1018	115-135[5]	NS	FA	GA	—	—	—	—	AS, NC, PC	Glue-acid coagulated for low water absorption. Cross-linked
1019	46–54	NS	FA	GA	—	—	—	—	AS, NC, PC	Glue-acid coagulated for low water absorption
1022	70–85	NS	RA	GA	—	—	—	—	NC	Glue-acid coagulated 1014 with higher Mooney viscosity
1023	46–54	ST	FA	GA	—	—	—	—	NC	Low water absorption and for low-temperature service. 13% Bd.Sty.
1061	44–52	NS	FA	SA	—	—	—	—	TU	Similar to 1006 but Polygard stabilizer. For light-colored products
X-274	55	SS	RA	SA	—	—	—	—	TU	Similar to 1001, 1002. For use in non-toxic formulations
FR-S 141	—	NS	FA	Spec.	—	—	—	—	FS	Has 44% Bd.Sty. 1006 plus 50 pts. styrene resin
FR-S 181	25–35	NS	FA	—	—	—	—	—	FS	Low Mooney 1006 for chemically blown sponge

[1] Mooney viscosity, ML-4 min. @ 212° F. of polymer. Underlined values are for compounded stock. Method of reporting varies from ranges to single averages. Where ranges differ between producers, special footnotes indicate these differences.
[2] Table 1A, of abbreviations, spells out codes used for producers, oil and carbon black types, and specific or general descriptions of materials used for coagulation, emulsification, and stabilization.
[3] All grades average 23.5% bound styrene unless otherwise noted in this column. Special properties or suggested special product applications indicated when such information was supplied by producers.
[4] 1006—MV for FS, 45-54; GT, 44-52.
[5] 1018—MV for NC, high.

TABLE 2 (CONTINUED)

ASTM No. or Other	MV[1]	Stab.[2]	Emul.[2]	Coag.[2]	Black[2] Type	Black[2] Amt.	Oil[2] Type	Oil[2] Amt.	Producers[2]	Description[3]
				HOT POLYMERIZED TYPES (CONTINUED)						
FR-S 182	40-50	NS	FA	AL					FS	43% Bd.Sty.
6003	High	NS	FA	GA	—	—	—	—	NC	For wire, low water absorption
8000	44	NS	FA	SA	—	—	—	—	TU	Bd.Sty. 43.5%. For use where flow required
1100	46–54	ST	FA	SA	EPC	50	—	—	SC	Hot rubber black masterbatch contains channel black
				COLD POLYMERIZED UNPIGMENTED TYPES						
1500	46–58	ST	RA	SA	—	—	—	—	AS, CR, FS, G, GG, PC, SC, TU	Gen.-purpose cold rubber. Better physical properties than hot varieties
1500C	46–58	ST	RA	SA	—	—	—	—	GT	Differs from 1500 in use of Wing-Stay 100 as stabilizer
Krylene	52	ST	RA	—	—	—	—	—	PO	Equivalent to 1500
1501	46–58	SS	RA	SA	—	—	—	—	GG	Equivalent to 1500 except less staining
1502	46–58	NS	FA/RA	SA	—	—	—	—	AS, CR, FS, GG, GT, PC, SC, TU	Non-staining 1500
1503	46–58	NS	FA	GA	—	—	—	—	AS, NC, PC	Glue-acid coagulated 1500 for low water absorption
Kryflex 200	55	NS	FA	—	—	—	—	—	PO	Equivalent to 1503
Krylene NS	55	NS	FA	—	—	—	—	—	PO	Similar to 1503 except normal instead of low ash content
Kryflex 252	—	NS	FA/RA	—	—	—	—	—	PO	Higher styrene content than normal
1504	45–59	NS	FA	GA	—	—	—	—	NC	Glue-acid coagulated for low water absorption. Bd.Sty. only 12%
1505-NS	34–46	NS	RA	SA	—	—	—	—	CR	Low Bd.Sty. (9%) for low-temperature service
1507	30–40	NS	FA/RA	SA	—	—	—	—	GT	Similar to 1502 except lower Mooney viscosity
1551	46–58	NS	RA	SA	—	—	—	—	TU	Non-staining 1500
3105	31–35	NS	FA/RA	AL	—	—	—	—	AS	Low Mooney viscosity for chemically blown sponge and adhesives
3110	24–30	NS	FA/RA	AL	—	—	—	—	AS	Similar to 3105 except even lower Mooney viscosity
4600	36–48	NS	FA	SA	—	—	—	—	GG	Similar to 1502 except lower Mooney viscosity and only fatty acid soap used
6100	75	ST	RA	GA	—	—	—	—	NC	Similar to 1500 except higher Mooney viscosity and low water absorption
FR-S 127	25–35	NS	FA/RA	SA	—	—	—	—	FS	Low Mooney viscosity for sponge
FR-S 146	35–45	NS	FA/RA	SA	—	—	—	—	FS	Low Mooney viscosity for light-colored sponge, mechanical goods
FR-S 179	125	NS	FA/RA	—	—	—	—	—	FS	High Mooney viscosity rubber for oil extension in Banbury
C-102	30–38	ST	FA/RA	AL	—	—	—	—	SC	Low Mooney, alum coagulated. Changed to 1507 with SA coag. For sponge and battery cases

TABLE 2. AVAILABLE DRY STYRENE-BUTADIENE RUBBERS (SBR) (CONTINUED)

ASTM No. or Other	MV[1]	Stab.[2]	Emul.[2]	Coag.[2]	Black[2] Type	Black[2] Amt.	Oil[2] Type	Oil[2] Amt.	Producers[2]	Description[3]
				COLD POLYMERIZED BLACK MASTERBATCH RUBBER						
1600	65–80	ST	RA	SA	HAF	50	—	—	SC, UR	1500 plus 50 HAF black
1601	62–74	ST	FA/RA	SA	HAF	50	—	—	PC, UR	1502 plus 50 HAF black, except that a staining stabilizer is used
1602	77–92	ST	FA/RA	SA	HAF	50	—	—	UR	1502 plus 50 HAF black
1603	50–65	NS	FA	GA	EPC	50	—	—	PC	Non-staining EPC black masterbach. Formerly 6611
1605	53–65	NS	FA	GA	FEF	50	—	—	PC, SC	Non-staining FEF black masterbatch from 1503
3750	58	ST	RA	Spec.	HAF	52	HA	10[6]	CR	1500 plus HAF black with oil as processing aid
3752	62	ST	RA	Spec.	ISAF	52	HA	12.5[6]	CR	1500 plus ISAF and oil as processing aid
3754	—	NS	FA/RA	Spec.	FEF	52	N	12.5[6]	CR	1502 plus FEF black masterbatch with oil as processing aid
4650	65	ST	RA	Spec.	HAF	55	HPO	10[6]	GG	1500 HAF black masterbatch plus oil as processing aid
4651	74	ST	RA	Spec.	HAF	62.5	HPO	12[6]	GG	Similar to 4650 with more black and more processing oil
4652	—	NS	RA	—	MT	150.0	—	—	GG	1501 with 150 parts MT black. For molded and extruded goods
4654	—	ST	RA	—	ISAF	52	HPO	10[6]	GG	1500 plus 52 ISAF black, 10 heavy process oil for tires and mechanicals
4655	—	ST	RA	—	HAF	52	HPO	10[6]	GG	1500 plus 52 HAF black, 10 heavy process oil, for tires and mechanicals
6604	55–70	ST	FA/RA	GA	SAF	40	HA	5[6]	PC	1500 with FA/RA soaps and glue-acid coagulation
8150	65–80	ST	RA	AL	HAF	50	—	—	TU	Base polymer 1500. Ultra dispersed black
9152	—	ST	RA	Spec.	SAF	40	HA	5	G	SAF black, 40; oil, 5. Used for very abrasive-resistant compounds
9153	—	ST	RA	Spec.	HAF	52	HA	10	G	HAF black, 52; oil, 10. Similar to 9152, but less abrasion resistant
9154	—	ST	RA	Spec.	ISAF	52	HA	12.5	G	ISAF black, 52; oil, 12.5. Displays wear characteristics between 9152 and 9153
B-123	54	ST	RA	SA	HAF	50	N	9[6]	UR	1502 plus 50 HAF black, 9 of oil as processing aid
B-129	66	NS	FA/RA	SA	EPC	50	—	—	UR	1502 plus 50 EPC black
B-134	60	NS	FA	SA	FEF	50	—	—	UR	1503 plus 50 FEF black
B-139	65	ST	RA	SA	HAF	50	—	—	UR	1500 plus 50 HAF black
B-147	58	ST	RA	SA	ISAF	50	A	10[6]	UR	1500 plus 50 ISAF black, 10 of oil
CB-102	56	ST	FA/RA	SA	EPC	50	—	—	SC	EPC black, 50; no oil. Easy processing. For mechanicals
OB-102	—	ST	RA	SA	ISAF	60	HA	10[6]	SC	ISAF, 60; 10 of oil. For tread rubber
OB-113	—	ST	RA	SA	HAF	52	HA	10[6]	SC	HAF 52; 10 of oil. For tread rubber and mechanicals

[6] Oil added as processing aid, not as extender.

TABLE 2 (CONTINUED)

ASTM No. or Other	MV[1]	Stab.[2]	Emul.[2]	Coag.[2]	Black[2] Type	Black[2] Amt.	Oil[2] Type	Oil[2] Amt.	Producers[2]	Description[3]
				COLD POLYMERIZED OIL-EXTENDED RUBBER						
1703	50–70[7]	NS	FA/RA	SA	—	—	N	25	AS, FS, GG, GT, PC, SC, TU	Gen.-purpose non-staining rubber with naphthenic oil
1705	50–65	ST	FA/RA	SA	—	—	A	25	GG	Differs from 1703 in type oil, and easier processing
1707	45–65[8]	NS	RA	SA	—	—	N	37.5	GG, SC, TU	Gen.-purpose with rosin for tack
1708	50–70[9]	NS	FA	GA	—	—	N	37.5	AS, GG, PC, TU	1707 with fatty instead of rosin acid, glue-acid coagulation for low water absorption
1709	45–65	ST	RA	SA	—	—	A	37.5	SC	1707 with aromatic oil
1710	48–62[10]	ST	FA/RA	SA	—	—	A	37.5	FS, GG	1705 with higher oil content
1710C	45–59	ST	FA/RA	SA	—	—	A	37.5	GT	1710 with Wing-Stay 100 as stabilizer
1711	45–65	ST	RA	SA	—	—	HA	37.5	TU	1709 with highly aromatic oil instead of aromatic
Krynol 651	52	ST	FA/RA	—	—	—	A	37.5	PO	Equivalent to 1710
1712	45–65[11]	ST	FA/RA	SA	—	—	HA	37.5	AS, CR, FS, G, GG, PC, SC, TU	1710 with highly aromatic oil for better processing
1712C	45–59	ST	FA/RA	SA	—	—	HA	37.5	GT	1712 with Wing-Stay 100 as stabilizer
1713	44–60[12]	NS	FA/RA	SA	—	—	N	50	AS, GT	Gen.-purpose high oil content for light-colored products
1714C	45–55	ST	FA/RA	SA	—	—	HA	50	GT	High oil content with maximum polymer protection. Wing-Stay 100 stabilizer
1773	53–67[13]	NS	FA/RA	SA	—	—	N	25	CR, GT	1703 with light oil for light-colored goods
1778	48–62[14]	NS	FA/RA	SA	—	—	N	37.5	CR, GT	1707 with mixed acids and light-colored oil
Krynol 652	52	NS	FA/RA	—	—	—	N	37.5	PO	Equivalent to 1778
3700	45–60	ST	FA/RA	SA	—	—	HA	50	CR	1712 with higher oil content
3900	62	NS	FA/RA	SA	—	—	Rosin	25	CR	Rosin for superior physical properties and improved tack
4700	55	NS	FA	GA	—	—	N	50	GG	1708 with higher oil content
4701	63	ST	FA/RA	SA	—	—	HA	50	GG	1712 with higher oil content
7701	47–57	ST	FA/RA	SA	—	—	A	31	SC	Intermediate oil content
8200	57	NS	FA	GA	—	—	N	37.5	TU	Extremely light-colored with low ash content
8201	53	NS	FA	GA	—	—	N	50	TU	1708 with higher oil content and low ash content
FR-S 123	45–59	ST	FA/RA	Spec.	—	—	A	31	FS	Gen.-purpose with special stabilization for better aging
FR-S 154	48–62	ST	FA/RA	—	—	—	A	37.5	FS	1710 with special stabilizer
FR-S 155	48–62	ST	FA/RA	—	—	—	HA	37.5	FS	1712 with special stabilizer
FR-S 173	53–67	NS	FA/RA	SA	—	—	N-NS	25	FS	For light-colored goods
FR-S 178	48–62	NS	FA/RA	SA	—	—	N-NS	37.5	FS	FR-S 173 with higher oil content
Polymer G	40–60	NS	FA/RA	SA	—	—	Not available		G	For low-temperature service. Oil content not disclosed

[7] 1703—MV for FS, 53-67; GG, 50-65; GT, 50-64.
[8] 1707—MV for GG, 50-65.
[9] 1708—MV for GG, 50-65; PC, 43-64.
[10] 1710—MV for GG, 50-65.
[11] 1712—MV for CR, GG, 45-60; FS, 48-62; PC, 45-62
[12] 1713—MV for GT, 45-55.
[13] 1773—MV for CR, 53-55 (typical).
[14] 1778—MV for CR, 52 (typical).

TABLE 2. AVAILABLE DRY STYRENE-BUTADIENE RUBBERS (SBR) (CONTINUED)

ASTM No. or Other	MV[1]	Stab.[2]	Emul.[2]	Coag.[2]	Black[2]		Oil[2]		Producers[2]	Description[3]
					Type	Amt.	Type	Amt.		
					Cold Polymerized Oil and Black Extended Rubbers					
1801	58–72	ST	FA/RA	SA	HAF	50	N	25	UR	1703 with black
1803	55–70[15]	ST	FA/RA	SA	HAF	50	A	25	PC, SC, UR	1705 with HAF black
1804	52–72	ST	RA	SA	HAF	60	HA	10[16]	SC	1500 with HAF black and oil processing aid
1805	50–65[17]	NS	FA	GA	HAF	75	N	37.5	GG, PC	1708 with HAF black
3751	73	ST	FA/RA	Spec.	HAF	75	HA	37.5	CR	1712 with HAF black
3753	65	ST	FA/RA	Spec.	ISAF	60	HA	37.5	CR	1712 with ISAF black
3755	—	NS	FA/RA	Spec.	FEF	75	N	50	CR	1778 with FEF black and 12.5 added oil
3756	—	ST	RA	Spec.	SRF	75	HA	17.5	CR	1500 with SRF black and oil for processing aid
3757	54	ST	FA/RA	Spec.	HAF	75	HA	50[18]	CR	1712 with HAF black and 12.5 added oil
3758	—	ST	FA/RA	Spec.	ISAF	75	HA	50[18]	CR	1712 with ISAF black and 12.5 added oil
3759	61	ST	FA/RA	Spec.	ISAF	60	A	37.5	CR	1712 with ISAF black
4750	62	ST	FA/RA	Spec.	HAF	75	HA	37.5	GG	1712 with HAF black
4751	57	NS	FA	Spec.	FEF	100	N	50	GG	FEF, 100; oil, 50
4752	77	ST	FA/RA	Spec.	ISAF	75	HA	37.5	GG	ISAF, 75; oil, 37.5. For tires and mechanicals
4753	50	ST	FA/RA	Spec.	HAF	75	HA	50	GG	HAF, 75; oil, 50. For camel-back and some mechanicals
6605	48–62	ST	FA	GA	HAF	75	HA	45[19]	PC	1708 with HAF black, staining stabilizer, and added oil
6608	48–62	ST	FA	GA	FEF	75	HA	45[19]	PC	6605 with FEF instead of HAF black
6620	50–65	ST	FA	GA	HAF	75	HA	37.5	PC	1708 with HAF black and staining stabilizer
8250	55–70	ST	FA/RA	Acid	HAF	50	HA	25	TU	Similar to 1803
8253	50.5	NS	RA	Acid	FEF	60	N	37.5	TU	1708 with FEF black
8254	67	ST	FA/RA	Acid	HAF	75	HA	37.5	TU	HAF, 75; oil, 37.5
8266	65	ST	RA	SA	ISAF	75	HA	37.5	TU	1711 with ISAF black
9250	—	ST	FA/RA	Spec.	ISAF	70	HA	45	G	ISAF, 70; oil, 45. For tread rubber with economy
9251	—	ST	FA/RA	Spec.	ISAF	60	HA	37.5	G	ISAF, 60; oil, 37.5. For tread rubber
9275	—	ST	FA/RA	Spec.	HAF	75	HA	45[19]	G	1712 with HAF black and 7.5 added oil. For tread rubber
OB-104	—	ST	FA/RA	SA	ISAF	82.5	HA	51.3	SC	ISAF, 82.5; oil, 51.3. For tread rubber
OB-106	—	NS	RA	SA	FEF	60	HA	37.5	SC	FEF, 60; oil, 37.5. For NS stock with FEF black
OB-110	—	ST	FA/RA	SA	HAF	82.5	HA	56.8	SC	HAF, 82.5; oil, 56.8. For tread rubber and mechanicals
OB-111	—	ST	RA	SA	ISAF	75	A	37.5	SC	ISAF, 75; oil, 37.5. For high-quality tread rubber
B-111	59–73	ST	FA/RA	SA	HAF	75	A	37.5	UR	1710 plus HAF, 75
B-119	48	NS	FA/RA	SA	HAF	50	N	37.5	UR	1778 plus HAF, 50
B-132	57	NS	FA/RA	SA	FEF	68.75	N	37.5	UR	1778 plus FEF, 68.75
B-142	54	NS	RA	SA	FEF	80	N	37.5	UR	1707 plus FEF, 80
B-151	51	NS	FA/RA	SA	HAF	75	N	37.5	UR	1778 plus HAF, 75
B-154	53	ST	FA/RA	SA	HAF	75	A	45[19]	UR	1710 plus HAF, 75; 7.5 extra oil

[15] 1803—MV for UR, 58-72.
[16] With only 10 parts of oil this rubber should have been numbered in the 1600 series.
[17] 1805—MV for GG, 57. Also has special coagulation.
[18] Oil considered to be 37.5 parts as extender for base polymer and 12.5 parts as processing aid.
[19] Oil considered to be 37.5 parts as extender and 7.5 parts as processing aid.

Vulkene,[1] Chemically Cross-Linked Polyethylene

By A. R. LEE and J. E. VOSTOVICH
General Electric Co., Bridgeport, Conn.

A. R. Lee

J. E. Vostovich

The Authors

Alfred R. Lee, product planner, wire and cable department, General Electric Co., Bridgeport, Conn., received his B.S. in electrical engineering from the University of Denver, Denver, Colo., in 1937.

Lee joined General Electric immediately after college as a student engineer and has progressed through several positions in the wire and cable departments of the company's Schenectady and Bridgeport plants. He is a member of the AIEE and the IPCEA.

Joseph E. Vostovich, insulation chemist, wire and cable department, General Electric Co., Bridgeport, was graduated in 1947 from Lehigh University with a B.S. in ChE.

After a short association with the Anthracite Institute, Wilkes-Barre, Pa., he joined G-E in 1948 and has been working as an insulation chemist since that time. He is a member of the American Chemical Society, the Connecticut Rubber Group, and the Bridgeport General Electric Engineer's Association.

POLYETHYLENE, which is universally known for its excellent electrical properties, is particularly attractive to the wire and cable industry. Witness the fact that this industry has increased its use of polyethylene tremendously over the past ten years. Polyethylene however, has one basic deficiency: namely, the low softening range (105-112° C.) which has limited its use in some applications. Recently this disadvantage was eliminated by the mechanism of cross-linking polyethylene. By this means polyethylene becomes a thermosetting-type material with a significantly higher softening range, thereby rendering it extremely resistant to unusual thermal conditions in wire and cable, such as current overloads or short circuits.

At the present time two methods are used to introduce cross-links between molecular chains in polyethylene: (a) cross-linking by irradiation; (b) cross-linking by means of organic peroxides. Both mechanisms rely upon the abstraction of hydrogen atoms to create free radicals by bond scission which then interact from chain to chain to form cross-links.

History

Many attempts have been made to cross-link polymeric materials chemically. In 1915, Ostromislensky[2] disclosed that natural rubber could be vulcanized with certain organic peroxides. Van Rossem *et al.*[3] carried out a somewhat extensive investigation of the cross-linking of natural rubber with benzoyl peroxide in 1931, and Blake,[4] in 1937, studied natural rubber vulcanizates cured with benzoyl peroxide.

Soon after the advent of polyethylene in the late Thirties, a British patent[5] was issued which taught that polyethylene could be cross-linked by using a free radical donor. This patent described the use of organic peroxides added to the polyethylene and heated above 40° C. At that time the process was not practical since the available peroxides decomposed below the softening (milling) temperature of the polyethylene. However, the introduction to the market several years ago of dicumyl peroxide by the Hercules Powder Co. provided the key to commercial production of chemically cross-linked polyethylene.

Early G-E Investigations

As a result of basic discoveries made by A. R. Gilbert and F. M. Precopio[6] of the General Electric research laboratory, an extensive investigation was carried out to determine the influence of various reinforcing agents, fillers, stabilizers, and organic peroxides.

[1] General Electric Co., Bridgeport, Conn.
[2] I. Ostromislensky, *J. Russ. Phys. Chem. Soc.*, 47, 1462, 1885, 1904 (1915); *Chem. Abs.*, 10, 1943, 3177 (1916).
[3] A. Van Rossem, P. Dekker, R. S. Prawirodipoero, *Kautschuk*, 7,202,220 (1931).
[4] J. T. Blake, P. L. Bruce, *Ind. Eng. Chem.*, 29, 866, 869, (1937).
[5] British patent No. 597, 833.
[6] A. R. Gilbert, F. M. Precopio, patents pending, United States Patent Office.

Chemically Cross-Linked Polyethylene

In recent months it has been found that the good electrical properties of polyethylene can be utilized at much higher temperatures by producing cross-linked polyethylene. This cross-linking has been accomplished by irradiation and by chemical means.

This paper presents the General Electric story of the development of a polyethylene cross-linked chemically using organic peroxides. Under the name Vulkene, it is being used by the company for a line of service drop cables and aerial secondary service. The material is resistant to weathering and sunlight as well as being very abrasion resistant so that it is used without the addition of a protective jacket necessary with some insulations that are unable to provide sufficient protective cover in themselves.

Vulkene is still new and is still undergoing development to improve the characteristics necessary for insulation, but already it has shown that it is superior to conventional polyethylenes in heat stability, making it a very desirable material for the wire and cable compounder.

The text and the illustrations present a very complete comparative evaluation of Vulkene with conventional polyethylene, primarily in many of the most important tests for wire and cable. It is felt that this will permit the wire and cable engineer to determine the advisability of adapting this material to solve his problems.

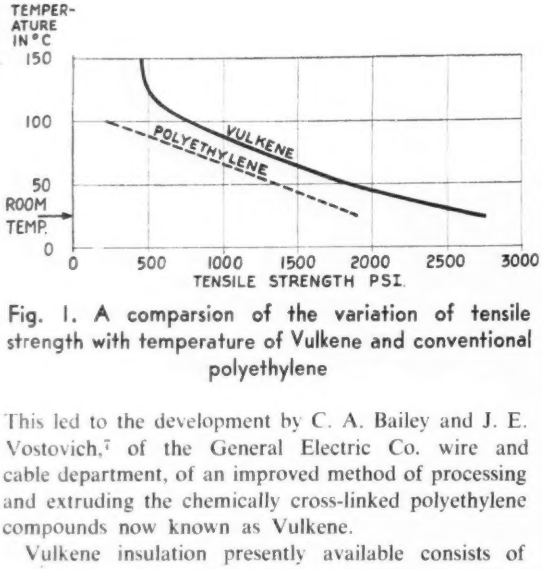


Fig. 1. A comparsion of the variation of tensile strength with temperature of Vulkene and conventional polyethylene

This led to the development by C. A. Bailey and J. E. Vostovich,[7] of the General Electric Co. wire and cable department, of an improved method of processing and extruding the chemically cross-linked polyethylene compounds now known as Vulkene.

Vulkene insulation presently available consists of polyethylene, which has been reinforced with a thermal carbon black and cross-linked by means of dicumyl peroxide. The ingredients are mixed in a Banbury-type mixer at a controlled elevated temperature, sheeted out on a warm mill, cooled, and granulated. The resultant material is applied to the conductor with conventional extruder equipment and cross-linked in a continuous vulcanization pipe under steam pressure similar to the process used to vulcanize rubber compounds. This composition results in an excellent balance of mechanical, thermal, chemical, and electrical properties.

General Characteristics

The tensile strength comparision of Vulkene with conventional polyethylene (Figure 1) illustrates one of the basic advantages of Vulkene. Although the tensile strength of Vulkene is only slightly higher than that of polyethylene at room temperature, there is a great difference at temperatures above 100° C. Obviously, polyethylene with a softening point of 105° C. has no tensile strength above this temperature; while Vulkene has a tensile strength of approximately 500 psi. at 150° C.

Fig. 2. Abrasion test conducted on wire samples hung over a "squirrel cage"-type holder consisting of five hard maple dowels of 1/2-inch diameter which has a reciprocating motion over 180 degrees. The samples are weighted with 3.5-pound weights

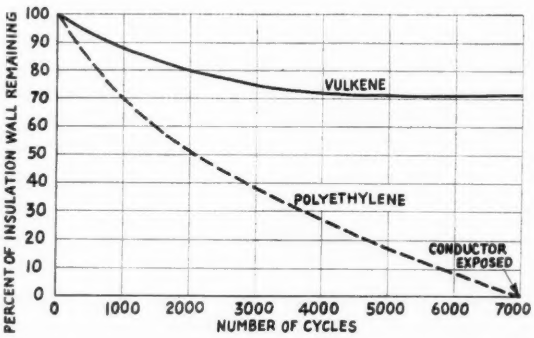


Figure 2 shows that Vulkene, owing to its good abrasion characteristics, will have many applications where unusual abrasion resistance is required. The cross-linkage, in addition to the reinforcing agent, contributes greatly to the improvement in abrasion resistance over conventional branched polyethylene.

The abrasion test referred to in Figure 2 was per-

[7] C. A. Bailey, J. E. Vostovich, patent pending, United States Patent Office.

TABLE 1. LOW-TEMPERATURE TESTS WIRE COVERINGS

	Cold Bend* 24 Hours at −40° F.	Cold Bend* 24 Hours at −65° F.	Cold Impact† 72 Hours at −65° F.
Engineering requirements	no cracks	no cracks	no cracks
Vulkene, #6 Awg,‡ stranded	passed	passed	passed
Conventional polyethylene, #6 Awg, stranded	passed	passed	cracked
Neoprene, #4 Awg, stranded	passed	cracked	—

* Same as MIL-C-3432A specification except that conditioning period was 24 hours instead of 20 hours.
† Same as MIL-C-5756B specification except that conditioning period was 72 hours instead of 48 hours.
‡ American Wire Gage standard numbers for wire sizes.

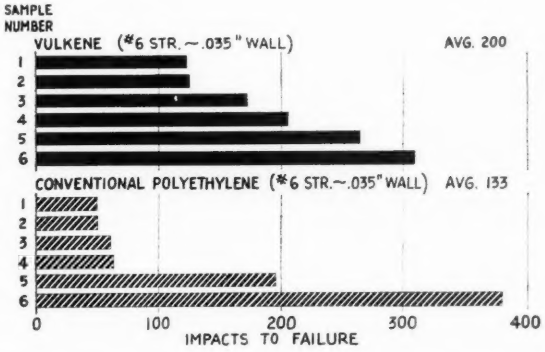


Fig. 3. Impact test results on Vulkene, compared with conventional polyethylene. A 27.5-pound weight is dropped 6.5 inches on the wire sample. Results, expressed in impacts to failure, are shown for six samples of each compound and arranged in order of results to emphasize the comparison

formed as follows. The test consists of a "squirrel-cage" type of cylinder with five ½-inch hard maple dowels. The "squirrel-cage" has a 180-degree reciprocating motion. The samples (usually three of each compound) are placed over the cage and held in position at the bottom with a 3½-pound weight on each sample. At periodic intervals the insulation wall is measured to determine the percentage remaining. Obviously, zero percentage would be an exposed conductor.

The increase in toughness as a result of cross-linkage is also illustrated by its resistance to impact (Figure 3). In this test a 27½-pound weight (the lower section shaped in the form of a wedge) was dropped a distance of 6.5 inches perpendicular to the axis of the cable sample. A complete description of the test can be found in MIL-C-13777[8] specification. Since the chemical cross-linkage transforms Vulkene into a thermo-

[8] United States Government Printing Office, Superintendent of Documents, Washington, D. C.

TABLE 2. COMPARISON OF VULKENE WITH CONVENTIONAL POLYETHYLENE AND NEOPRENE IN SEVERAL ACCELERATED TESTS COMMON IN THE WIRE INDUSTRY

(See text for further descriptions of tests and results.)

Test Performed	Vulkene	Conventional Polyethylene	Neoprene
1. Ozone test—ozone concentration 0.03%, wrapped on 4-inch o.d. mandrel, temperature at 25° C.*	OK after 98 hours	OK after 98 hours	cracks after 1½ hours
2. Environmental stress cracking. Immersed in Igepal CA at 50° C.†	no cracks after 720 hours	cracks in 24 hours	—
3. Heat softening test, in modified Fisher-Johns melting point apparatus.‡ Softening point	>275° C.	110° C.	—
4. Moisture resistance test. Seven days' immersion in water at 70° C. Results in mg. of water/in.²§	1.64	0.5	—
5. Weather-Ometer test. Exposed for 1300 hours, wrapped on one-inch o.d. mandrel in Atlas Weather-Ometer.¶	no cracks	no cracks	—

* "IPCEA Standard S-19-81," Second Edition, Section 4.4. The Insulated Power Cable Engineers Association, Montclair, N. J.
† ASTM Bulletin No. 218, pp. 25-26. The American Society for Testing Materials, Philadelphia, Pa. (Dec., 1956).
‡ Fisher Scientific Co., Pittsburgh, Pa. Catalog 59 (1958).
§ "IPCEA Standard S-19-81," Appendix N, Section 2.
¶ Atlas Electric Devices Co., Chicago, Ill.

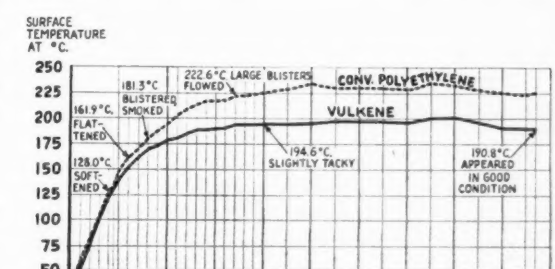


Fig. 4. Effect of overheating caused by high current in wires with Vulkene and conventional polyethylene coatings. Test run on #6 AWG (0.035-inch wall) service drop cables with 220 amp., 60 cycles, through the conductor. Test is conducted in a wooden trough to minimize air currents

setting-type material, the Vulkene insulation is more flexible; hence, it has more crack resistance to sharp blows.

The series of low-temperature tests performed on Vulkene, conventional polyethylene, and a standard-

TABLE 3. ELECTRICAL PROPERTIES OF VULKENE DURING IMMERSION IN WATER MAINTAINED AT 50° C.

The dielectric power loss was 2.0 KV. (60 cycles) and insulation resistance 0.5 KV., D.C.

Length of Immersion	Power Factor %	Dielectric Constant	Insulation Resistance Megohms per 1000 Feet
1 hour	4.51	7.66	9,567
1 day	4.77	7.68	8,000
7 days	4.80	7.79	9,944
14 days	4.91	7.76	9,644
21 days	4.94	7.96	8,900

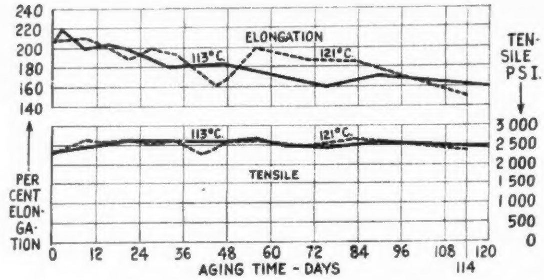


Fig. 5. Physical properties of Vulkene after aging at 113° C. and 121° C. Test conducted on #14 solid wire with 3/64-inch wall of insulation

type neoprene insulation (Table 1) indicate that Vulkene has a marked superiority in this field. The cold bend tests[9] were performed by wrapping the cable around a mandrel after the cable had been properly conditioned at the required time and temperature. While the cold impact test requirement described herein is used only occasionally, the results demonstrate the ability of Vulkene to withstand unusual low-temperature service conditions. In the cold impact test[10] a one-pound weight is dropped a distance of three feet perpendicular to the axis of the cable after the stated conditioning period. A crack at the point of contact on the surface of the cable constitutes failure.

The comparison of Vulkene with conventional polyethylene in other physical tests (Table 2) indicates that Vulkene has excellent ozone resistance due to its saturated molecular structure. Samples of insulated cable (#6 stranded 3/64-inch wall) were bent around a mandrel four times the diameter of the cable and conditioned at room temperature for 30-45 minutes. The samples were then placed into the ozonizer (0.03% ozone) and observed periodically.

One of the deficiencies of polyethylene, environmental stress cracking, is eliminated with the use of Vulkene because of the nature of its composition. The main points of this test are as follows. Test samples cut ½-inch by 1½-inches from a molded slab, 0.125-inch thick, were immersed in boiling water for 30 minutes and conditioned for 24 hours at room temperature. A slit, ¾-inch long and 0.020- to 0.025-inch deep, was cut in the center of each specimen. The samples were bent 180 degrees and placed into a jig. The entire assembly was placed into a test tube, covered with a surface-active agent, Igepal CA-630,[11] and maintained at a temperature of 50° C. Frequent observations were made.

In the heat softening test, the samples were sandwiched between two micro-cover glasses and placed on an electrically heated aluminum block. When droplets of liquid appeared between the cover glasses, the melting point was read from a thermometer directly attached to the aluminum block.

The moisture resistance test was performed as follows. Test specimens of #14 Awg solid insulated wire were dried to a constant weight in vacuum at 70° C. and placed into freshly boiled distilled water at 70° C. for 168 hours. After the seven-day immersion period, the water was cooled to room temperature, and the samples were removed, weighed, and again dried in a vacuum at 70° C. to a constant weight.

For the Weather-Ometer test, wire samples (#6 Awg stranded with an 0.035-inch wall thickness) were wound around a mandrel and conditioned at room temperature for 30-45 minutes. The specimens were then placed into a standard Atlas Weather-Ometer for a period of 1300 hours.

To determine the chemical and solvent resistance, Vulkene was tested in accordance with ASTM, D 543-52-T,[12] Test for Resistance of Plastics to Chemical Reagents (Tentative), using both the standard and the supplementary reagents contained therein. Owing to the low consistent results no tabular results are included here. The test specimens were in the form of bars, three inches by one inch by ⅛-inch. This test requires seven days' immersion at 23° C. The reagents consist of sulfuric acid, sodium hydroxide, ethyl alcohol, acetone, ethyl acetate, ethylene dichloride, carbon tetrachloride, toluene, heptane, sodium chloride, phenol, nitric acid, hydrochloric acid, acetic acid, oleic acid, ammonium hydroxide, sodium carbonate, hydrogen peroxide, and citric acid. In all cases, after this treatment, Vulkene was virtually unaffected. To cite an example, the Vulkene samples which were immersed in acetone had only a 2% increase in size and 0.8% increase in weight.

Electrical Properties

Table 3 illustrates the general electrical properties of Vulkene. Nine samples of #6 Awg conductor insulated with 3/64-inch thickness of Vulkene were immersed in tap water at a temperature of 50° C. Water immersion tests of this nature are used in the cable industry to afford an accurate measurement of the electrical properties since the water forms an intimate ground reference plane. More importantly, it allows an accelerated measure of the moisture-resistance of

[9] Run as in MIL-C-3432A specification, except conditioning period was 24 hours instead of 20 hours.

[10] Same as MIL-C-5756B specification except conditioning period was 72 hours instead of 48 hours.

[11] General Dyestuff Corp., Antara Chemical Division, New York, N. Y.

[12] American Society for Testing Materials, Philadelphia, Pa.

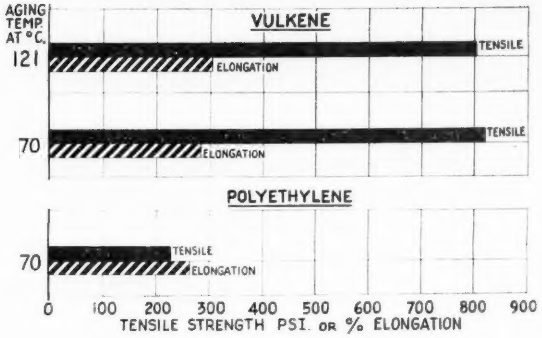


Fig. 6. Physical properties of Vulkene and polyethylene measured at 100° C. after seven days' aging at the temperature indicated in circulating air oven

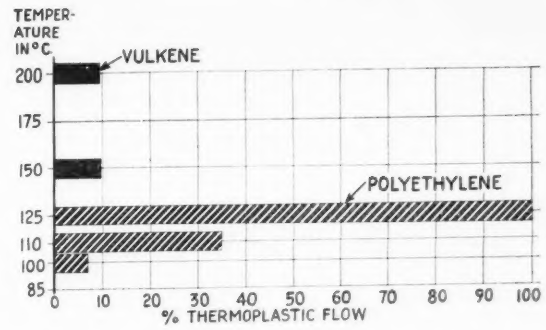


Fig. 7. Thermoplastic flow under weight of 15 psi, and at temperature indicated. (See text for description of test)

the material under test. The stability of the power factor, dielectric constant, and insulation resistance in this test indicate Vulkene to be good on moisture resistance. The values of these three properties are entirely adequate for service drop cable and other similar 600-volt cable applications.

Heat Resistance

If there is one property in which Vulkene is outstanding in relation to conventional polyethylene, it is in heat resistance. It is felt that the superior heat resistance is related to the carbon-to-carbon bonds formed during the cross-linking reaction. Some of these heat aging characteristics are shown in Figures 4, 5, and 6.

Figure 4 demonstrates Vulkene's resistance to overloads and short circuits. Two #6 Awg conductors, one insulated with polyethylene and the other with Vulkene, were placed at room temperature in a wooden trough (to minimize air currents) with a constant current of 220 amperes flowing through the conductors. The surface temperature of the 12-foot cables was measured with a copper-copnic thermocouple placed at the center of the cable. The thermocouple was connected to a potentiometer. It is obvious that after four minutes the polyethylene insulation had softened (at 128° C.). Within eight minutes (at 181° C.), the polyethylene insulation had blistered, while the Vulkene insulation remained essentially unchanged even after 77 minutes.

After 114 days in circulating air at 113° C. (Figure 5), the tensile strength of Vulkene has not changed; while the elongation has retained 80% of its original value. More rigorous aging at 121° C. for 114 days finds the tensile still unaffected, while the elongation retains 75% of its original value. The temperatures of both tests are used by Underwriters' Laboratories for approval of heat-resistant insulations.

It has long been recognized that although many rubber and plastic compounds have reasonably high, room temperature tensiles, these values fall off drastically when measured at elevated temperatures. This reduction in mechanical properties is even more severe after the materials have been subjected to accelerated aging and subsequently tested above ambient temperatures. Figure 6 illustrates the physical properties of Vulkene which has been aged in a circulating air oven and then tested at 100° C. After a seven-day aging period at either 70 or 121° C., Vulkene still has a tensile strength of 800 psi, when tested at 100° C., as compared to polyethylene's 225-pound tensile after seven days' aging at 70° C.

Figures 7 and 8 show the superiority in resistance to distortion of Vulkene over conventional polyethylene. Thermoplastic flow (Figure 7) was measured on disk-shaped specimens, supported on a stationary anvil in a circulating air oven, fitted with a presser foot (connected to a micrometer) and suitable weights so as to apply a pressure of 15 psi. The oven temperature was varied from 100 to 200° C., and the samples were preheated six minutes before the load was applied. The sample thickness was measured before preheating and after the load application period of six minutes. The ratio of the original sample thickness to the thickness at the end of the load application period measures the degree of deformation. It is apparent that, at 200° C., the thermoplastic flow of Vulkene was less than 10%, compared to polyethylene which, at 100° C., showed a flow of 7½%.

In Figure 8, demonstrating thermoplastic flow on wire samples tested in accordance with ASTM specification D 734-50T, Specification for Insulated Wire and Cable: Vinyl Chloride Plastic Compound (Tentative), Vulkene shows only 20% deformation at 130° C., as compared to 35% for general-purpose polyvinyl chloride and full flow for linear polyethylene. This indicated that Vulkene forms an infinite network. Both thermoplastic flow tests are essentially the same type except for sample type and gage load.

Figure 9 shows Vulkene's dimensional stability at high temperatures. After heating to a temperature of 200° C., both linear and branched polyethylene have been seriously affected, while Vulkene has remained unchanged.

Summary and Conclusions

This development of Vulkene provides the wire and cable industry with another insulation material to an-

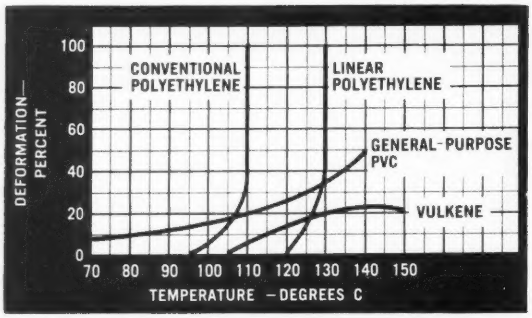


Fig. 8. Heat deformation of various insulations on #14 AWG solid wire with 3/64-inch insulation. Tested to ASTM D 734-50T (Insulated Wire & Cable Specification) with a test load of 500 grams

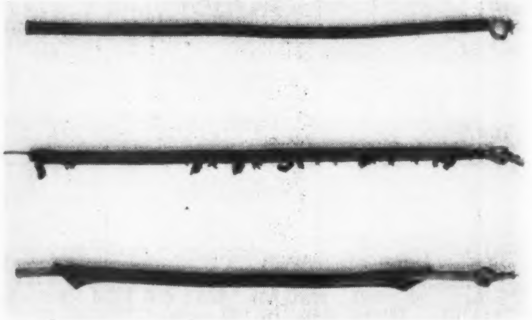


Fig. 9. Dimensional stability of various polyethylene insulations subjected to very high temperature tests of 200° C., *top*, Vulkene (GE-2107); *center*, linear low-density polyethylene; *bottom*, branched, high-density polyethylene

swer the needs of its customers. If a direct comparison is made with other materials, such as conventional polyethylene, it might appear that a compromise of properties has been affected in this new development. However, two factors should be borne in mind when considering this material for use:

1. This development is in its early stages, and rapid progress can be expected to strengthen all characteristics of the material.
2. The cable design engineer can utilize the material in applications where its most desirable properties are of greatest value.

Its outstanding properties of interest to the wire and cable designer and user are enumerated in the following tabulation:

1. Heat Stability
   a. A continuous temperature rating of 75° C. with a possibility of increasing this value when long-time tests are completely evaluated.
   b. Ability to withstand short-time temperatures of high values caused by overload or short circuit conditions.
   c. Excellent dimensional stability at elevated temperatures.
2. Mechanical Properties
   a. Exceptional resistance to abrasion.
   b. Resistance to impact crushing.
   c. Excellent low-temperature characteristics.
   d. Excellent resistance to weathering and sunlight.
   e. Resistance to a variety of solvents and chemical reagents.

In addition, the electrical properties are good and, while not outstanding to the same degree as conventional polyethylene, are superior to several thermoplastic and thermosetting wire insulations now being used in many applications. New developments are expected to increase these electrical properties also.

Based on an overall evaluation of these characteristics, the company with which the authors are associated has introduced a line of Vulkene cables for service drop and aerial secondary service. The outstanding resistance to weathering and sunlight permits Vulkene to be used without the addition of a protective jacket such as is necessary with some insulations. In addition, its ability to withstand abrasion and other mechanical damage makes it ideally suited for this service. Another application is for tree wire for use on insulations where again its mechanical properties are of prime importance.

As is indicated in the data shown above, Vulkene, owing to its cross-linked molecular structure, has superior resistance to many chemicals. In environments investigated so far, Vulkene will withstand attack by many chemicals that will destroy other cable insulations or jacket coverings. It would appear, therefore, that this new insulation may provide an answer to wiring problems in chemical plants that cannot now be solved by conventional materials or require much more elaborate or costly covers.

As pointed out, the first applications of Vulkene are those in which its best properties (excellent thermal and mechanical properties) are of primary consideration. As improvements in this material occur, the applications will be broadened. For example, only modest improvements need be made in the electrical properties before it is suitable for use at voltages up to at least 5000 volts. Preliminary work on the material in thin walls indicates that its heat resistance may afford an outstanding advantage for hookup wire in that the insulation will not shrink back or melt when subjected to soldering temperatures.

In conclusion, this new family of wire and cable insulations, accomplished by cross-linking and reinforcing, now known as Vulkene, affords unlimited opportunities to the wire and cable designer and engineer for new and more economical solutions of wire and cable problems.

Acknowledgment

The authors wish to acknowledge the helpful assistance of W. O. Eastman, J. B. Felter, and M. J. Langan, of the wire and cable department, General Electric Co.

Heat, Ozone, and Gamma Radiation Stability of Highly Saturated Adduct Rubber Vulcanizates[1]

By G. E. MEYER, F. J. NAPLES, and H. M. RICE
Research Division, Goodyear Tire & Rubber Co., Akron, O.

ADDUCTS prepared by the chemical addition of mercaptans to the unsaturated bonds in diene polymers were discussed in general terms in a previous paper.[2] The initial evaluation of a number of properties reported in that paper indicated that the highly saturated adducts, particularly, should be very useful in fabricated products designed to function under conditions which normally cause rapid deterioration of most rubbers.

In further work on the highly saturated methyl mercaptan adducts of emulsion polybutadiene, the effects of high-temperature air-oven aging, high ozone concentration, and exposure to large quantities of gamma radiation have been studied in more detail. In each case, stocks of the commercially available rubber or rubbers which are most resistant to the type of degradation involved were subjected to the same conditions to serve as a basis for comparison.

Other important properties of the adducts such as their high solvent resistance, low gas permeability, and physical properties at elevated temperatures will be discussed in later papers.

[1] Presented before the Division of Rubber Chemistry, ACS, Chicago, Ill., Sept. 12, 1958. Contribution No. 233 from the Goodyear research laboratory.
[2] R. M. Pierson *et al., Rubber & Plastics Age*, 38, 592 and 708 (1957); RUBBER WORLD, July, 1957, p. 529, Aug., 1957, p. 695.

Polymers Selected

Procedures for the preparation of adduct rubbers have been described elsewhere.[2] For the adducts studied here, the reaction involved the addition of methyl mercaptan to the unsaturated bonds of polybutadiene by a free radical chain process. The reaction was carried out in latex medium, with the adducts being isolated by conventional techniques.

Saturation levels were calculated from the results of sulfur analyses. On the assumption that each sulfur atom represents the saturation of one double bond by the addition of one mercaptan molecule, the % saturation indicates the proportion of butadiene segmers in the original polymer to which the mercaptan has been added.

Vulcanizates were prepared by normal rubber testing techniques. The curing recipes and conditions are listed in the appropriate tables. The other materials used were standard rubber compounding grade chemicals.

Aging Stability of Adduct Rubbers

This study evaluates the aging stability of adduct elastomers under more severe conditions than before. The elastomers used were highly saturated (over 80%) methyl mercaptan adducts of emulsion polybutadiene. The resistance of these potentially low-cost specialty rubbers to the degradative effects of ozone, high-temperature air-oven aging, and gamma radiation was investigated and reported in some detail.

These materials are shown to be extremely resistant to the effects of ozone attack even in the case of a 95% saturated adduct tested without any added antiozonant. This stock withstood ozone attack for 300 hours under conditions which caused deterioration in neoprene in one hour and in butyl in 20 hours.

Exposed to 300° F. air-oven, the adducts retained useful stress-strain properties several days longer than neoprene, with the 95% saturated adduct matching the aging properties of resin-cured butyl for five days. In the 500 to 600° F. range of temperature the highly saturated adducts outperformed both neoprene and resin-cured butyl.

Upon exposure to gamma radiation, the adducts proved to be much more stable than natural rubber that has been reported quite radiation resistant and retained their high stability over the temperature range of −120 to +200° F.; whereas natural rubber's rate of degradation increased rapidly with increased temperature in this range.

Harlan McK. Rice

Glen E. Meyer

F. John Naples

The Authors

Glen E. Meyer, head, reactive diene rubber section, research division, Goodyear Tire & Rubber Co., received his B.S. degree from Albany College in 1935, and his Ph.D. in physical chemistry from Johns Hopkins University in 1939.

Dr. Meyer did post-doctorate research at Johns Hopkins University in 1939 and 1940 and was also with the U. S. Army Chemical Warfare Service in 1940. He was with the Plantations Division, United States Rubber Co., in Sumatra in 1941, and the Naugatuck Chemical Division of the same company, 1942-1945; then he returned to the Plantations Division in Malaya, 1946-1949. From 1950-1952 he did technical sales service for Latex & Rubber, Inc. He joined Goodyear in 1953 and was assigned his present post in 1956.

He is a member of the American Chemical Society and its Division of Rubber Chemistry.

F. John Naples, senior research chemist, research division, Goodyear Tire & Rubber Co., was awarded his A.B. in chemistry from Youngstown College in 1933, his M.S. in physical chemistry from the University of Vermont in 1934, and his Ph.D. in organic chemistry from Indiana University in 1936.

Dr. Naples served in several teaching positions, first at Youngstown College as instructor of chemistry and physics, 1936-1937, then as head of the chemistry department of Springfield Junior College, 1937-1940, and finally as associate professor of chemistry at Youngstown College, 1940-1943. In 1943 he started with Goodyear as a research chemist.

He is a member of the American Chemical Society and of Phi Lambda Upsilon.

Harlan McK. Rice, research compounder, research division, Goodyear Tire & Rubber Co., received his A.B. from Hiram College in 1931 and his M.S. in physical chemistry from Syracuse University in 1934.

He served with the Solvay Process Division of Allied Chemical Co., 1934-1943. He joined Goodyear in the research division as a research compounder in 1943.

Mr. Rice is a member of the American Chemical Society and its Division of Rubber Chemistry. He is also a member of Alpha Xi Sigma.

Testing Procedures

In general, few variations from standard procedures were required for the work reported here, but significant points are listed below:

(a) For high-temperature air-oven aging, portions of tensile sheets (one- by three-inch strips) were wrapped loosely, but separately in aluminum foil, and groups of these pieces were placed in mechanical convection air-ovens for the periods of time and temperatures listed in the tables, after which the test pieces were died out for actual testing.

(b) For ozone exposure at room temperature, half-inch wide strips from tensile sheets were held at 10% elongation by stapling them to plywood. The samples were examined at intervals in order to determine the onset of visible cracks.

(c) For exposure to gamma radiation from a Cobalt 60 source, portions of tensile sheets were wrapped separately in aluminum foil in the same manner as for high-temperature aging, and normal procedures of exposure were used.

Peroxide Cure Used

Various tests had shown that the uncured adduct polymers deteriorated slowly at temperatures up to the 500 to 600° F. range, but sulfur-cured vulcanizates under the same conditions degraded at a much higher rate.

TABLE 1. CURING RECIPES AND ORIGINAL TENSILE AND ELONGATION VALUES OF VULCANIZATES USED

	Adducts				Butyl
Saturation, %	80	88	95	Butyl 218*	100
HAF black	50	50	50	HAF black	50
DiCup 40 C	5.5	5.5	7	Amberol ST-137†	12
Hydrated lime	2	2	2	Neoprene WHV‡	5

	Neoprene, GNA		Natural Rubber, RSS
Neoprene GNA‡	85	Natural rubber	100
Neoprene AC‡	15	HAF black	45
Thermal black	95	Stearic acid	2.5
Hard clay	15	Zinc oxide	3
Amine antioxidant	4	PBNA	1
Plasticizer	6	Santocure¶	0.8
Stearic acid	1	Sulfur	2.25
NA-22§	0.35		
Wax	1		
Magnesium oxide	6		
Zinc oxide	10		

	Adducts			Butyl	Neoprene	Natural
Cure, min./°F.	60/320	60/320	60/320	70/330	30/295	60/280
Tensile, psi.	1850	2390	2470	2140	1410	4350
Elongation, %	530	500	485	525	450	410

* Isobutylene-isoprene copolymer, Enjay Corp., New York, N. Y.
† Modified phenolic resin, Rohm & Haas, Philadelphia, Pa.
‡ Chloroprene polymers, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
§ 2-Mercapto imidazoline, Du Pont.
¶ N-cyclohexyl-2-benzothiazolesulfenamide, Monsanto Chemical Co., Akron, O.

These results suggested that other curing systems producing cross-links of higher stability should yield correspondingly more stable vulcanizates. Carbon-to-carbon cross-links, such as those produced by radiation and peroxide curing systems, should be expected to be in the latter category. Since peroxide is the more generally applicable of these systems, it was chosen for our investigations.

The increased high-temperature stability of peroxide-cured vulcanizates was obvious in the very first samples aged at high temperature. The most stable vulcanizates developed were those cured with a combination of hydrated lime and DiCup 40C.[3]

The curing recipes and the original tensile and elongation values for the adducts and the other stocks used for comparison in the high-temperature aging and radiation studies are listed in Table 1.

High-Temperature Aging

The development of resin-cured butyl[4] has extended the usefulness of this rubber to higher temperature ranges; therefore it must be included in evaluations of elastomers for use at elevated temperatures. Neoprene, of course has long been widely used for heat-resistant rubber products. Table 2 lists data obtained on adducts, resin-cured butyl, and neoprene after air-oven aging at 300° F. Table 3 lists the data for the same stocks after air-oven aging in the 500 to 600° F. range.

TABLE 2. COMPARISON OF ADDUCTS WITH BUTYL AND NEOPRENE IN AIR-OVEN AGING AT 300° F. RESULTS EXPRESSED IN % OF PROPERTY RETAINED

Time, Days	Saturation, %	Adducts			Butyl	Neoprene
		80	88	95	—	—
1	Tensile	70	100	100	90	100
	Elongation	65	100	95	75	45
3	Tensile	35	85	88	75	92
	Elongation	20	75	85	57	13
5	Tensile	—	50	80	60	—
	Elongation	—	35	60	55	—

TABLE 3. COMPARISON OF RESULTS OF AIR-OVEN AGING AT 500 TO 600° F. RESULTS AS % OF PROPERTY RETAINED

Conditions, Hr./°F.	Saturation, %	Adducts			Butyl	Neoprene
		80	88	95	—	—
1/500	Tensile	85	78	87	92	77
	Elongation	77	100	90	95	24
3/500	Tensile	88	73	85	10	brittle
	Elongation	60	81	88	175	brittle
3/550	Tensile	—	70	55	melted	—
	Elongation	—	75	80	melted	—
2/600	Tensile	—	25	20	melted	—
	Elongation	—	60	80	melted	—

At 300°F. the 95% saturated adduct appears to be equivalent to the resin-cured butyl sample for at least five days. After seven days' aging the surface hardening was such that cracks formed when the samples of adduct were bent sharply.

In the range of 500 to 600° F. (Table 3) the adducts appear to outperform readily both neoprene and butyl. These data suggest the adducts would still be useful after several hours' air aging at 500° F.

In other experiments, for which the data are not given here, DiCup-cured adduct gumstocks aged for seven days at 300° F. retained more than 80% of both their tensile and elongation, with no visible evidence of surface hardening. At 500° F. and higher, however, the gumstocks deteriorated somewhat faster than the black stocks.

Ozone Resistance

The outstanding resistance of the highly saturated adducts to degradation by ozone is illustrated by the

[3] Dicumyl peroxide, 40% active, Hercules Powder Co., Wilmington, Del.
[4] United States patent No. 2,701,895 and "The Vulcanization of Butyl Rubber with Phenol Formaldehyde Derivatives," presented before the Division of Rubber Chemistry, ACS, Cincinnati, O., May 15, 1958, by P. O. Towney, J. R. Little, and P. Viohl, United States Rubber Co., New York, N. Y.

TABLE 4. OZONE RESISTANCE

(10,000 Pphm Ozone at Room Temperature)

Stock	Antizonant	Time to Crack
Neoprene W*	4 pts. UOP-88‡	1 hr.
Butyl, resin cured	none	3.5 hrs.
Butyl 218, sulfur cured†	none	20 hrs.
Adducts		
88% sat.	2 pts. UOP-88	over 300 hrs.§
95% sat.	none	over 300 hrs.§
95% sat.	1 pt. UOP-88	over 300 hrs.§

* Recipe: HAF, 50 pts.; MgO, 6; Altax,[1] 2.5, and stearic acid, 1.
† Recipe. SRF, 50 pts.; ZnO, 5, sulfur 2; Tuads,[1] 1.5.
‡ Universal Oil Products Co., Des Plaines, Ill.
§ Limit of test: samples checked for tensile/elongation, see text.
[1] R. T. Vanderbilt Co., New York, N. Y.

TABLE 5. EFFECT OF GAMMA RADIATION ON ADDUCTS AND NATURAL RUBBER AT VARIOUS TEMPERATURES

Tensile/Elongation, % Retained

Exposure, Megareps*	Temperature °F. −120	75	200
	Adducts (88% Sat.)		
40	105/85	100/80	100/75
100	100/45	85/55	90/55
200	—	—	80/40
	Natural Rubber		
40	80/90	65/85	20/35
100	55/50	50/40	6/15

* The erg per gram carbon has been recommended by the ANP Advisory Committee for Nuclear Measurements and Standards for all Air Force programs of radiation research and development. See RUBBER WORLD, Dec., 1958, p. 382. The roentgen-equivalent-physical (rep) in common use before the erg pr gram carbon was recommended is equivalent to 84.6 ergs of absorbed radiation energy (produced by Compton scattering) per gram of carbon. The megarep, of course, is equal to one million reps.

data in Table 4. The test was discontinued after 300 hours, and the adduct stocks were submitted for stress-strain tests to see if some undetected deterioration had occurred. The tensile and the elongation values obtained were identical with those measured on unexposed samples.

The curing recipes for the adducts are not listed in Table 4 since both sulfur-cured and peroxide-cured stocks showed the same ozone resistance. In preliminary tests at 2,500 pphm ozone, the 80 and 85% saturated adducts, with no antiozonant, developed cracks in 40 minutes and one hour, respectively.

It should be noted that the 95% saturated adduct required no antiozonant to have exceedingly high ozone resistance. Other samples of the stocks that are listed in Table 4 and the 80% saturated adduct were aged in both a Weather-Ometer[5] and a Fade-Ometer[5] for 1,000 hours. None of the samples showed measureable deterioration during these exposure periods.

Gamma Radiation Resistance

Resistance to degradation by radiation is becoming of increasing importance as uses of nuclear energy grow. Among the rubbers which are available in large commercial quantities, natural rubber is reported[6] to have a longer useful life than others when exposed to gamma radiation.

Data are presented in Table 5 comparing adducts with a natural rubber stock at various levels of exposure over a temperature range of —120 to +200° F. The rate at which the adduct deteriorates appears not to be influenced by temperature, within the range studied. The deterioration of the natural rubber, on the other hand, increases considerably as the temperature increases. Also, the data show the adduct to be much less susceptible to deterioration, even at the temperatures where natural rubber is considered to be good compared to other commercial rubbers.

Unfortunately, less data were obtained on the 95% saturated adduct; however, the measurements that were made indicated it deteriorated at a somewhat lower rate than the 88% saturated adduct.

[5] Atlas Electric Devices Co., Chicago 13, Ill.
[6] R. Harrington, *Rubber Age* (N. Y.), 83, 472 (1958).

Summary and Conclusions

Even though there is still more to be studied concerning the properties of the highly saturated adducts, their resistance to specific degradation effects that were the particular object of this report lead to the following conclusions:

1. The adducts exhibit a very high level of resistance to degradation by each of the influences studied and show increased resistance with increasing saturation levels.

2. (a) The most highly saturated adduct studied (95%) appears to match resin-cured butyl up to about five days' air-oven aging at 300° F., and all the adducts studied show better aging than neoprene at this temperature. (b) At 500 to 600° F., the adducts appear far superior to both resin-cured butyl and neoprene.

3. The 95% saturated adduct exhibited a stability that was many times the stability of either Butyl 218 or neoprene upon exposure to ozone.

4. Both the 88 and 95% saturated adducts exhibited much greater resistance to degradation by gamma radiation than natural rubber. Also, within the temperature range studied, —120 to +200° F., the adducts maintained this resistance; whereas natural rubber degraded at an increasingly higher rate as the temperature increased.

Acknowledgments

The authors wish to express their appreciation for the assistance received from many of their coworkers, from L. B. Bangs for the radiation data, and particularly to R. M. Pierson, under whose encouraging guidance this work was done.

MEETINGS and REPORTS

L. A. Meeting Draws 630; Banbury Goodyear Medalist

The outstanding success of the seventy-fifth meeting of the Division of Rubber Chemistry of the American Chemical Society, held separate from the parent Society at the Biltmore Hotel, Los Angeles, Calif., May 13-15, was a tribute to the planning and efforts of the chairman, secretary, and other officers of the Division and to the hard-working local committee on arrangements headed by A. J. Hawkins, Jr., E. I. du Pont de Nemours & Co., Inc., and B. R. Snyder, R. T. Vanderbilt Co., as co-chairman. Papers presented at the technical sessions were of high caliber and attracted consistently large audiences; plant trips were well attended; and the Division banquet at the Beverly-Hilton was enjoyed by 630 members and guests, of whom 230 were wives of members and guests. Registration at Los Angeles was 629, an extremely satisfactory figure for a West Coast meeting.

E. H. Krismann, Du Pont, Division chairman, opened the meeting at Technical Session A on May 13 by welcoming those who had come to Los Angeles for this meeting. He commended the local committee for its work in preparing for the affair and then mentioned the business meeting to be held on the morning of May 14 at which the 1959 Charles Goodyear Medalist would be named, and the Best Paper Award for the September, 1958, meeting made. He commented upon some of the early preparations for the L. A. meeting and the planned symposia on ozone and its effects on rubber and on urethanes and the surprisingly large number of papers which had been offered for the meeting.

Chairman Krismann turned the May 13 Technical Session A over to G. T. Gmitter, General Tire & Rubber Co., for the symposium on urethanes. W. J. Sparks, Esso Research & Engineering Co., Division vice chairman, presided over the concurrent Technical Session B on the afternoon of May 13, which session dealt with ozone effects on rubber. The presiding officers of the other sessions are indicated in connection with the further review of some of the papers which follows later in this meeting report.

As indicated later also, Fernley H. Banbury, the inventor and developer of the Banbury mixer, was selected to receive the Division's Charles Goodyear Medal for 1959.

25-Year Club Luncheon-Meeting

The regular luncheon-meeting of the Division's 25-Year Club on Wednesday noon, May 13, was featured by a fine attendance of 141 persons. This attendance was due in part to the invitation extended to those in the rubber industry on the West Coast with 25 or more years of service, but not at present members of the 25-Year Club, to attend this meeting. E. G. Partridge, director of the Tlargi Rubber Technology Foundation at the University of Southern California, chairman for this 25-Year Club meeting, started the proceedings by first extending a welcome to both those from the West Coast and elsewhere who were attending the meeting for the first time.

Left to right: **A. J. Hawkins, Jr., co-chairman, local arrangements; E. H. Krismann, Division chairman; B. R. Snyder, co-chairman, local arrangements**

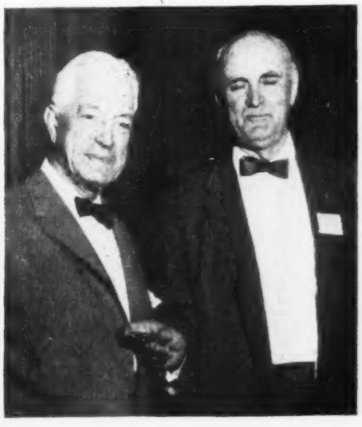
Dr. Partridge then asked those present to stand for a moment of silence in tribute to Club members who had passed on since the last meeting. These members were as follows: F. H. Springer, Davol Rubber Co.; C. J. Minnig, Witco Chemical Co.; T. A. Werkenthin, U. S. Navy, Bureau of Ships; and H. H. Thompson, Xylos Rubber Co. In the last case, "Tommy" Thompson's death had occurred just a few days before the Los Angeles meeting which he had planned to attend.

H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., presided over the elimination contest for the selection of the member present with the longest period of service in the rubber industry who had not previously been so honored. Dr. Winkelmann announced also that the chairman for the next meeting of the Club in Washington, D. C., in November, would be C. A. Bartle, of Du Pont, and that a roster of members of the Club would be published for distribution at the Washington meeting by C. M. Baldwin, United Carbon Co.

Paul Van Cleef, consultant and former senior partner and founder of Van Cleef Bros., with 53 years of service in the industry, won the coveted memento at the L. A. meeting. He explained that he had entered the rubber industry in 1906 with the firm of Eugene Aremstein Co., Chicago, Ill., manufacturer of rubber cements for the shoe trade. Van Cleef Bros. was formed in 1909 and became a division of Johns-Manville Corp. in 1947.

The Business Meeting

At the business meeting of the Division held on the morning of May 14, Chairman Krismann first asked the 1958 chairman, R. F. Dunbrook, Firestone Tire & Rubber Co., to make the Best Paper Award for the September, 1958, Chicago meeting. This award



H. A Winkelmann, *right*, presenting 25-Year Club memento to Paul Van Cleef for 53 years in Rubber

Fernley H. Banbury, 1959 Charles Goodyear Medalist

R. F. Dunbrook, 1958 Division chairman, presents Chicago Best Paper Awards to Frank Fekete, R. W. Pike, and T. C. Williams

was made for the paper, "Cyanosilicone Elastomers—A New Class of Solvent-Resistant, High-Temperature Rubbers," by R. A. Pike, F. A. Fekete, and T. C. Williams, all of the Silicones Division, Union Carbide Corp., and was based on the quality of its contents and of the visual aids used and its oral presentation.

Acting for the chairman of the nominating committee, J. M. Ball, Midwest Rubber Reclaiming Co., the Division secretary, R. H. Gerke, United States Rubber Co., announced the nominations for officers and directors to be elected by letter-ballot before the November, 1959, meeting. Officers nominated for a one-year term are as follows: chairman, W. J. Sparks, Esso Research; vice chairman, W. S. Coe, Naugatuck Chemical Division, United States Rubber Co., and L. M. Baker, General Tire; secretary, Dr. Gerke; and treasurer, G. E. Popp, Phillips Chemical Co.

Directors from the areas served by some of the local rubber groups nominated for a two-year term comprised: *Northern California*, W. H. Deis, Merck & Co., Inc., and N. R. Legge, Shell Development Co.; *Connecticut*, R. T. Zimmerman, R. T. Vanderbilt, and H. Gordon, Bond Rubber Corp.; *Detroit*, W. D. Wilson, R. T. Vanderbilt, and R. H. Snyder, U. S. Rubber; *Southern Ohio*, D. A. Meyer, Dayton Rubber Co., and H. E. Schweller, Inland Mfg. Division, General Motors Corp.; *Philadelphia*, J. R. Mills, Goodall Rubber Co., and R. A. Garrett, Armstrong Cork Co.; *Rhode Island*, J. M. Vitale, Crescent Co., Inc., and R. W. Szulik, Acushnet Process Co.; *Southern Rubber Group*, M. Mirsky, Guiberson Corp., and J. M. Bolt, Naugatuck Chemical; *Washington, D. C.*, A. T. McPherson, National Bureau of Standards, and P. S. Forsyth, U. S. Defense Department.

As chairman of the Charles Goodyear Medal Award Committee, Dr. Dunbrook announced that Fernley H. Banbury, inventor of the Banbury mixer and its developer for many different applications in the mixing of rubber stocks, had been selected to receive the Charles Goodyear Medal of the Division at its next meeting in Washington, D. C., in November of this year.

Dr. Banbury was born in Cornwall, England, in 1881. He was employed in a foundry and machine shop and as a draftsman for an engineering firm and attended Plymouth Technical School and the Camborne and Penzance School of Mines at Cornwall. He came to the United States at the age of 22 and obtained a degree in electrical engineering from Purdue University in 1906. He studied at the Lewis Institute in Chicago and was employed by the Commonwealth Edison Co. and its engineering firm, Sargent & Lundy. For five years he worked with Dr. Edward B. Acheson, inventor of carborundum, in this country and in Europe. He then became sales engineer for Werner & Pfleider Co.

In 1916 he took his patent for the Banbury mixer and joined the Birmingham Iron Foundry, Derby, Conn. Later he became manager of the Banbury mixer department of Farrel-Birmingham Co., from which he retired in 1943, but continued his association with the company as a consultant until 1951.

The Medalist received a Modern Pioneer Award from the National Association of Manufacturers in 1940. In 1948, Purdue University awarded him the honorary degree of Doctor of Engineering.

Members were next asked to observe a moment of silence in memory of recently deceased members of the Division, who were as follows: R. L. Lasser, Harwick Standard Chemical Co.; T. A. Werkenthin, U. S. Navy Bureau of Ships; D. Stefano Oberto, Pirelli; F. H. Springer, Davol Rubber; E. R. Lawrence, Spencer Products Co.

It was explained that owing to poor attendance at some recent Division banquets, only one formal banquet a year at the spring meeting will be held, beginning in 1960. A noon luncheon will replace the formal banquet, and the suppliers' cocktail party on the evening of the same day will round out the day's events for those meetings when no banquet is scheduled. Goodyear Medal Award presentations will be made at spring meetings; therefore another Goodyear medalist may be selected for announcement at the November, 1959, meeting. The award would then take place at the Spring, 1960, meeting of the Division.

It was also announced that an amendment to the by-laws will be proposed which would increase the terms of directors from two to three years in order that only one-third of the directors would have to be elected each year.

Division Banquet

The local committee on arrangements should have been more than gratified by the 630 members and guests, including 230 ladies, who attended the Division's banquet on the evening of May 14 at the Beverly-Hilton Hotel. Transportation from the headquarters hotel in downtown Los Angeles to the Beverly-Hilton by bus, with points of interest pointed out by a local committee member on each bus, while another member of the local committee provided champagne supplied by courtesy of many of the suppliers to the industry, was one of the unusual events connected with this meeting.

A social hour preceded the banquet itself, and there was music for dancing during dinner. Chairman Krismann presided and introduced the officers and directors of the Division, the Los Angeles Rubber Group, and the local

committee members. He again paid tribute to the local committee and Tlargi for the very great success of the L. A. meeting.

Excellent entertainment in the form of variety acts was followed by dancing; then the return trip was made to downtown L. A. by bus. No champagne was needed for the return trip.

Plant Trips and Ladies' Program

Plant trips on the afternoon of May 14 included Douglas Aircraft Co. plants at Long Beach and El Segundo. The DC-8 is made at Long Beach, and the Navy Attack Bomber A3D at El Segundo. Other trips included Lockheed Aircraft Corp. at Burbank, where the turbo-prop Electra is made, and the Shell Chemical Corp. copolymer plant at Torrance. Arrangements for these trips were taken care of by Dr. Partridge.

The ladies' program was highlighted by a guided tour of Disneyland, luncheon, and a fashion show on May 14. A tea on the afternoon of May 13 afforded an opportunity for the ladies to get acquainted with one another. C. M. Churchill, Naugatuck Chemical, was in charge of these events.

Technical Sessions

Although abstracts of the papers presented at this meeting were published in the April issue of RUBBER WORLD, special features of many of these papers not covered in the abstracts or which seemed to warrant reemphasis have been collected and are presented below.

Technical Session A on "Urethane Foams and Elastomers," with G. T. Gmitter, General Tire & Rubber Co., presiding, on May 13, covered new techniques of controlling the polymerization of polyurethane foams, properties, and applications of loaded flexible urethane foams, new organotin catalysts for the isocyanate-polyether reaction, a study of the mechanism of water with isocyanates, chemical compounding of liquid urethane elastomers, etc. Some additional highlights of these papers are as follows.

"Urethane Polyether Prepolymers and Foams—Influence of Chemical and Physical Variables on Reaction Behavior," by H. G. Scholten, J. G. Schuhmann, and R. E. TenHoor, Dow Chemical Co., stated that although the chemical and physical properties of both the polyglycols and aryl diisocyanates currently in use have been materially improved in the recent past, there are still many factors considered to have an effect on urethane prepolymer technology that have not been correlated with prepolymer behavior.

The net CPR value, or controlled polymerization concept, was presented as a means toward producing specific and predictable prepolymers and foams. It involves quantitative analyses of trace components in the polyglycol and toluene diisocyanate as a means of obtaining optimum net catalytic balance for any prepolymer reaction. The reaction times established in the laboratory using this procedure correlate well with plant production at the 50-2000-gallon level.

"Organotin Compounds as Catalysts for Reactions of Isocyanates with Active Hydrogen Compounds," by F. Hostettler and E. F. Cox, Union Carbide Chemicals Co., Division of Union Carbide Corp., described the development of high-activity organotin catalysts which made possible the development of a one-shot process for foaming polyether intermediates based on propylene oxide. The authors anticipate that organotin compounds will eventually become a significant factor for many other urethane applications, such as rigid foams and perhaps elastomers and coatings.

"Some Properties and Applications of Loaded Flexible Urethane Foams," by S. J. Assony and S. Chess, American Latex Products Corp., showed that flexible poly(esterurethane) foams can be produced with increased tensile strength and load-bearing capacity and with improved moldability, quick rebound, and other desirable properties by the incorporation of suitable reinforcing fillers such as silica, titanium dioxide, calcium carbonate, alone or in combination and in concentrations up to 40 parts on 100 of rubber. One application of loaded urethane foams currently under critical evaluation is their use in non-deflatable or blowout-proof tires.

"Mechanism of the Reaction of Water with Isocyanates," by G. Shkapenko, G. T. Gmitter, and E. E. Gruber, General Tire, first explained that since the external expression of all reactions occurring in the hydrolysis of the isocyanate group is a change in the isocyanate concentration and the evolution of carbon dioxide, these two parameters were used to follow the course of hydrolysis.

The reaction of water with o-tolyl isocyanate in a 1:2 ratio at 80° C. in the presence of triethylamine catalyst, for example, indicates about 48-52% of carbon dioxide is evolved as the result of decomposition of carbamic acid formed from the isocyanate-water reaction. An additional 30-35% of the carbamic acid or CO_2 is tied up as the anhydride, which, as the reaction temperature is increased to 100° C., results in the evolution of the maximum amount of CO_2 or 85-87% of the theoretical. Acidification of the reaction medium decomposes the o-tolyl ammonium-N-o-tolyl carbamate and accounts for another 4-5% of CO_2 at 80° C.

"Chemical Compounding of Liquid Urethane Elastomers," by R. J. Athey, Du Pont's elastomer chemicals department, discussed linear, isocyanate ter-

25-Year Club luncheon-meeting; E. G. Partridge, chairman, right foreground

A scene from the Rubber Division Banquet held at the Beverly-Hilton Hotel

minated compounds which react with aromatic diamines to produce vulcanizates which are high molecular weight polyurea polyurethane polymers. Stress-strain curves for three polymer vulcanizates indicate a range of properties from the conventional rubber range up to those with a Shore D hardness of about 80. This latter polymer yields vulcanizates which may be called "elastoplastic" since they have properties intermediate between those of hard elastomers and structural plastics.

"The Development of Cast Urethane Elastomers for Ultimate Properties," by K. A. Pigott, B. F. Frye, K. R. Allen, Samuel Steingiser, W. C. Darr, J. H. Saunders, and E. E. Hardy, Mobay Chemical Co., discussed in some detail the influence of the molecular structure of the starting material, i.e., polyester, diisocyanate and chain extender on the physical properties of cast polyester-urethane elastomers. For example, the largest changes in the glass transition temperature were obtained by varying the structure of the polyesters. Low-temperature properties of the elastomers were shown to be dependent to some degree on isocyanate structure and on the degree of cross-linking, and high-temperature dependence to be largely associated with degree and nature of cross-linking.

Technical Session B on "Effect of Ozone on Rubber," which consisted of contributed papers and was presided over by W. J. Sparks, Esso Research & Engineering Co., also on May 13, dealt with ozone chambers for accelerated testing, as compared with outdoor exposure, compounding variables affecting antiozonant requirements, screening antiozonants, and special features of some new antiozonants.

"Compounding Variables Affecting Antiozonant Requirements," by William L. Cox, Universal Oil Products Co., reported on increasing antiozonant requirements for oil-black SBR stocks and for certain natural rubber-SBR stocks where certain antiozonants were used in the latter case. This paper emphasized also that waxes differ so widely in the "compatibility" with antiozonants that through improper selection of the wax used in comparative studies erroneous generalizations as to the relative merits of antiozonants under consideration may be reached.

"A Method of Screening Antiozonants," by F. A. V. Sullivan and A. R. Davis, American Cyanamid Co., was based upon the ability of a chemical compound to suppress the reaction of ozone with cyclohexene when a mixture of the two is subjected to the action of a stream of ozonized air. Since the number of organic compounds available for screening as potential antiozonants is now approaching the million mark, the value of this method for selecting compounds for testing in rubber is obvious. Using N, N'-di-octyl-p-phenylenediamine as a reference compound, several derivatives each of N, N'-dicyclohexyl-p-phenylenediamine, diaminodurene, dianisidine, 1,2,3,4-tetra-hydroquinoline, 4-aminodiphenylamine were tested for possible use as antiozonants for rubber.

Chas. H. Kuhn, Tlargi chairman, *left*, and R. H. Gerke, Division secretary, at banquet

"Correlation of Ozone Chamber and Outdoor Exposures," by H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Co., reported on exposures of rubber samples in ozone chambers and outdoors in Chicago and elsewhere which were started in April, 1952. It was found that although ozone chamber exposures correlate closely with 30-day outdoor exposures when all tests are considered together, after six or seven years the outdoor exposure causes a greater degree of cracking than the ozone chamber. Also, a major cause of ozone cracking and poor weather aging of molded rubber parts is caused by a poor mold surface finish. Poor dispersion of pigments is another cause of poor weather aging, it was said.

"Comparative Performance of Antiozonants in Road and Accelerated Tests in the Los Angeles Area," by F. B. Smith, Naugatuck Chemical, emphasized the unusual effectiveness of N-isopropyl N' phenyl p-phenylene diamine (Flexzone 3-C) in protecting from ozone cracking both truck and passenger-car tires made with natural rubber and SBR or blends thereof. Accelerated weathering wheel tests correlated well with actual road tests.

"Wing-Stay 100 as an Antiozonant," by J. C. Ambelang and B. W. Habeck, Goodyear Tire & Rubber Co., presented some additional information on this new antiozonant which showed that three to four phr. in SBR 1500 or four phr. in SBR 1712 result in excellent protection against static and kinetic exposure in either an ozone atmosphere or out-of-door weathering.

The technical session on "Effect of Ozone on Rubber," on May 14, comprised the invited papers on this subject and H. A. Winkelmann presided over this session. Operation of ozone chambers to minimize variation, the resistance of rubber vulcanizates when used in insulation and on military vehicles, ozone cracking of rubber in the Los Angeles area, were some of the subjects covered.

"Operation of Ozone Chambers in Rubber Laboratories to Minimize Variation in Test Results," by M. Lowman, Goodyear, reported that as a result of a program in the rubber committees of the American Society for Testing Materials and the Society of Automotive Engineers on determining the causes of variation in static ozone testing in ozone test chambers, certain factors were found to be of major significance. These follow: (1) A complete change of air in the ozone test chamber every one minute 20 seconds or oftener is required. (2) The sample should have a 72-hour rest period after being placed on the mandrel specified in ASTM D 1171 before being placed in the test chamber. (3) Special care must be observed in handling the test specimens: for example, the surface of the test sample should not be touched between the start of the preconditioning period and the end of the test.

"Ozone Resistance of Rubber Insulations," by W. H. Couch, G. H. Hunt, and O. S. Pratt, Simplex Wire & Cable Co., stated that the resistance of high-voltage rubber insulation to corona discharge is dependent not only upon the ability of the compound to resist cutting at constant load, but also upon its rate of tensile stress decay at constant elongation. When these two properties of a vulcanizate are studied independently, the information may be applied to the development of corona resistant compounds.

"Weather Aging of Elastomers on Military Vehicles," by W. D. England, J. A. Krimian, and R. H. Heinrick, Detroit Arsenal, described the results of three years of weather aging of rubber products in the high ozone area of Pasadena, Calif. It was found that ozone resistance of synthetic elastomers, particularly SBR, can be improved by the addition of suitable antiozonants and waxes to the rubber compound; butyl and neoprene compounds become less ozone resistant when plasticized to meet low-temperature requirements; polyurethane rubbers look promising for items used on military vehicles when the use of these rubbers becomes economically feasible; and for storage purposes, a surface coating with 50/50 mixture of dioctyl-p-phenylenediamine and acetone promises to impart good ozone resistance to tires that were not protected against ozone during manufacture.

Participants and moderator, invited papers ozone symposium: *Left to right, standing,* W. D. England, G. H. Hunt, J. O. Harris, R. M. Murray; *seated,* M. F. Brunelle, H. A. Winkelmann, moderator, M. P. Lowman

"Ozone Cracking of Rubber in the Los Angeles Area," by A. J. Haagen-Smit, California Institute of Technology; M. F. Brunelle, Los Angeles County Air Pollution Control District; and J. W. Haagen-Smit, A. O. Beckman, Inc., showed a nearly linear relation between cracking of a standard rubber test piece and exposure time, with average total oxidant during the exposure period indicated. Results for a three-year test period were presented, and it was concluded that the rubber test is useful in the interpretation of effect of outdoor exposure tests on rubber goods. The application of the test to area surveys in air pollution studies was suggested.

"Factors Influencing the Ozone Resistance of Neoprene Vulcanizates under Flexure," by R. M. Murray, of Du Pont's elastomer chemicals department, emphasized the need of dynamic testing conditions to study the attack of ozone on elastomeric vulcanizates. In connection with the effect of compounding ingredients on the ozone resistance of neoprene vulcanizates, it was reported that nickel dibutyl dithiocarbamate (NBC), gives good ozone protection without affecting scorch; while Thermoflex A (a mixture of aromatic secondary amines) provides greater protection than NBC, yet impairs scorch to only a moderate degree.

Neoprene's ozone resistance increases linearly with increasing antiozonant concentration, but decreases with increasing amounts of filler. Linseed oil, unlike most other plasticizers, functions as a strong antiozonant in neoprene when 10 or more parts are present.

It was also reported that Hypalon (chlorosulfonated polyethylene) and Viton (a copolymer of vinylidene fluoride and hexafluoropropylene) were completely resistant to ozone attack even under dynamic test conditions.

Some of the Division directors and officers present at Los Angeles

Technical Session A, as continued on the morning of May 15, with B. R. Snyder, R. T. Vanderbilt Co., presiding, included papers on polymerization, new rubbers, and new information on old rubbers.

"The Chelating Agent in Sulfoxylate Polymerization," by R. D. Spitz and A. K. Prince, Dow Chemical Co., showed that for a typical SBR sulfoxylate polymerization system, ethylenediaminetetra acetic acid was the only agent of the group tested that supported the polymerization rate. Further, it was shown that the concentration of the chelant could be lowered with little effect on the rate. Consideration of these and other facts presented in this paper could result in substantial chelating agent cost reduction for synthetic rubber producers, it was said.

"Preparation and Physical Properties of Mixtures of Butadiene-Acrylic Acid and Butadiene-Vinylpyridine Elastomers," by C. A. Uraneck and R. J. Sonnenfeld, Phillips Petroleum Co., was an interesting demonstration of another variable in compounding of elastomers whereby two copolymers that contain functional groups capable of interaction provide a means of introducing orientation and crystallinity that could not otherwise be readily attained in a polymeric system. Copolymers with butadiene of acrylic acid and 2-methyl-5-vinylpyridine were selected because of the relative simplicity of the reaction of an acid and a base.

"Constitution and Variability of Rubber from Individual Trees," by A. R. Kemp, Tlargi Rubber Technology Foundation, described a special procedure for collecting rubber latex directly from the tree by dropping it directly into alcohol to coagulate and preserve it. The method was used to

Most of the participants and moderator, urethane symposium: *left to right,* B. F. Frye, R. J. Athey, G. T. Gmitter, moderator, S. J. Assony, and J. G. Schuhmann

Some of participants and moderator, contributed papers ozone symposium: *left to right,* F. B. Smith, G. N. Vacca, B. W. Habeck, W. L. Cox, and W. J. Sparks, moderator and Division vice chairman

collect samples from 24 different trees in a Costa Rica rubber estate to determine possible variations in the properties of rubber from these trees. The alcohol coagulum from four of the trees yielded a distinctly grey mottled coagulum, apparently due to the presence of clotted grey lutoids not evident in the latex itself, which finding was unexpected.

"Butyl Rubber Latex—A Review of Its General Properties in Non-Transport Applications," by A. L. Miller and K. W. Powers, of Esso Research, described a new anionically emulsified latex of Enjay Butyl 268 designated as MD-600-55, a very stable latex with unusual tolerance for pigments and ionic materials. Deposited films can be cured in boiling water and display the typical properties of butyl rubber. Typical applications include paper coatings, non-woven fabrics and adhesives.

"Gel Formation in Styrene-Butadiene Rubbers," by C. A. Carlton, J. M. Huber Corp., showed that the amount and the type of gel formed in SBR, when masticated in the Banbury, are dependent on both time and temperature and that a substantial quantity of "tight" gel is formed at 350° F. Some accelerators, antioxidants, antiozonants, chemical plasticizers, plasticizing oils, retarders, and tackifiers have a marked influence on type and amount of gel formed. Some inhibit gel formation while others are gel promoters. The p-phenylene diamine derivatives prevent gel formation at relatively low concentrations. Oxygen seems to be necessary for gel formation. The presence of gel has an adverse effect on the physical properties of SBR 1500-HAF black tread compound, particularly as regards resistance to flex cracking and cut growth.

"Terpolymer Rubbers—Standardization of Infrared Analysis by Chemical and Radio-Tracer Methods," by George B. Sterling, John G. Cobler, Duncan S. Erley, and Fred A. Blanchard, Dow Chemical, described a procedure involving the use of radioactive tracer techniques combined with standard chemical methods for standardizing infrared spectroscopic measurements of a terpolymer of methyl isopropenyl ketone, butadiene, and acrylonitrile. The technique is generally applicable where a component of the polymer can be synthesized from radioactive materials, and it has been applied to the accurate product control of this terpolymer rubber.

"A High-Temperature, Fluid-Resistant Fluorocarbon Elastomer," by D. A. Stivers and F. J. Honn, Minnesota Mining & Mfg. Co., discussed a high-strength linear fluorocarbon composed of vinylidene fluoride and hexafluoropropylene copolymer called Fluorel. Resistance to heat and compression set in the presence of destructive fluids makes this new elastomer useful between 400 and 600° F. Other properties are competitive with certain non-fluorinated special-purpose elastomers.

"Fibrous Silicone Rubber," by R. A. Russell, Connecticut Hard Rubber Co., provided data on the compression-deflection, compression set, porosity and water absorption, thermal conductivity, etc., of this new form of expanded silicone rubber which is comprised of a random web-like arrangement of hollow filaments.

"A Study of Abrasion and Road Wear of Butyl Tires through Designed Compounding Experiments," by R. L. Zapp, C. W. Umland, II, Enjay Co., Inc.; and L. R. Sperberg, 3-T Test Fleet, Inc., emphasized the value of properly designed experiments in reducing the number of runs necessary to arrive at the required amount of information in such work. Compound changes based on these experiments indicated road life improvements of as much as 30%.

Technical Session B, continued on May 15, with A. J. Hawkins, Du Pont, presiding, included general papers on vulcanization, compounding, etc.

"Room-Temperature Sulfur and Non-Sulfur Vulcanization of Natural Rubber—I," by H. S. Fisher, University of Southern California, presented some interesting information on the room-temperature vulcanization of slabs of pale crepe rubber containing piperidinium N-pentamethylene dithiocarbamate and zinc oxide embedded in powdered sulfur and on similar slabs containing yellow mercuric oxide embedded in powdered quinone dioxime. With the sulfur cure, chemical combination of sulfur with the rubber hydrocarbon goes on apparently from the time the sulfur and the accelerator come in contact with the rubber and, in the presence of an excess of sulfur, continues without reaching a maximum even up to at least 115 weeks. With mercuric oxide and quinone dioxime, tensile strength of the vulcanizate reached a maximum in about 405 days and retained this maximum for about 800 more days.

"Vulcanization with TMTD," by E. M. Bevilacqua, United States Rubber Co., outlined a mechanism which he considered adequate to explain substantially all that is known about vulcanization with tetramethylthiuram disulfide. This mechanism presumes that, in the presence of rubber, vulcanization is a principal, and not an incidental, result of the reaction. Modification in detail may be required as certain of its predictions are investigated in more detail and the outline of the stoichiometry now established is filled in.

"Improved Butyl Rubber Vulcanizates—Sulfur Donor and Low Sulfur-High Accelerator Vulcanization Systems," by C. J. Jankowski, K. W. Powers, and R. L. Zapp, Enjay Co., reported that superior butyl rubber vulcanizates were obtained when a sulfur donor system (morpholine disulfide and tetramethyl thiuram disulfide) or a low sulfur-high accelerator vulcanization system (0.33 S and 4.0 tellurium diethyl dithiocarbamate) was used in place of normal loading of sulfur and accelerator. Butyl rubber vulcanizates obtained in the first two formulations had aging characteristics equivalent to or superior to those vulcanized with a

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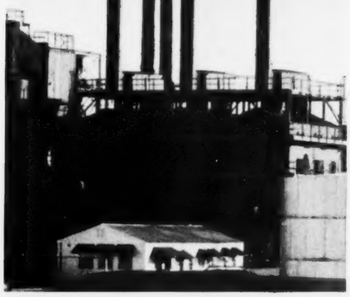

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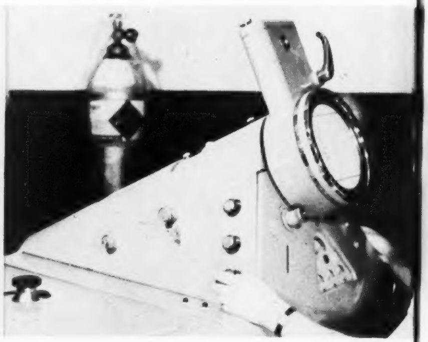

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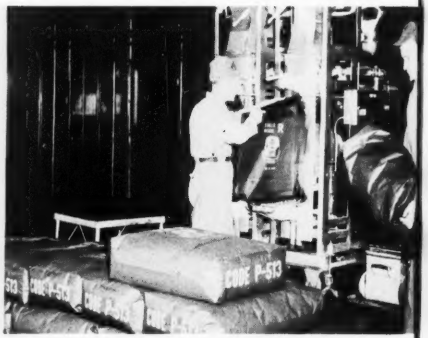

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"Cardolite Brand NX-3256 and NX-3216 Resins for Curing Butyl Rubber for Heat-Resistant Applications," by F. A. Moller and D. A. Stivers, 3M, explained how dimethylol meta-substituted phenol resins cure butyl rubber giving original and heat aged properties corresponding to those obtained with para-substituted phenols and that an experimental dimethylol meta-substituted phenolic resin exhibited an improvement in heat-resistance properties compared with the above resins. Also, dimethylol derivatives of some ortho-substituted phenols cure butyl rubber with stannous chloride dihydrate as a catalyst.

"Chemical-Loaded Molecular Sieves as Latent Curing Aids—III. A New Resin Curing System for Butyl Rubber," by F. M. O'Connor and R. L. Mays, Linde Co., Division of Union Carbide Corp., described a new butyl rubber curing system comprised of Chemical-Loaded Molecular Sieve CW-3615 (anhydrous hydrogen chloride), zinc oxide, and Neoprene Type W as accelerator for the phenol dialcohol used as a curing agent, in connection with the fabrication of tire curing bags. The disadvantages previously encountered when active accelerators were employed such as premature curing, corrosion, and sticking of the compound to processing equipment, have been eliminated, it was said.

"The Influence of the Order of Addition of Compounding Ingredients on Stocks Milled at Elevated Temperatures," by H. C. Jones, New Jersey Zinc Co., emphasized that early addition of zinc oxide and carbon black in the hot mixing cycle with natural rubber and SBR compounds yielded vulcanizates with the best physical properties. Tendency toward prevulcanization was greatest under these conditions, however. Zinc oxide has a stabilizing effect on high-temperature mixings, particularly when thiuram and sulfenamide accelerators were used, as indicated by the high quality of the stress-strain and resilience properties of the compounds. Furnace blacks behave differently from channel blacks, and the point at which the carbon black is introduced has a definite bearing on the properties of the compound.

"Cure Lag in the Curing of Laboratory Test Specimens," by H. A. Freeman and S. D. Gehman, Goodyear, reported that there is no cure lag in platen-press sheet curing of a specimen of 0.075-inch thickness, under proper curing conditions. Cure lag at the center of a one- by one- by two-inch tread compound rebound block cured in a 1.65-inch thick mold amounted to eight minutes equivalent cure at a given temperature, and cure lag under the same conditions at the center of a natural rubber gum stock amounted to 11 minutes' equivalent cure at a given temperature. The heat loss from the mold to the room air for molds of 0.75-inch and 1.63-inch thickness was shown to be greater with the thicker mold.

"Development of Rubber-Based Insulation Materials for Solid Propellant Rocket Motors," by O. D. Ratliff and H. J. McSpadden, Astrodyne, Inc., stated that new rubber-based insulation materials had been developed that exhibited lower heat transfer rates than several of the commercially available plastic resin-based insulators. The ability of the rubber-based insulation material to transmit less heat was thought to be due to the lower coefficient of thermal conductivity at the extreme temperatures involved (5000° F.) than the plastic resins used in the commercial insulators and the fact that the heat absorbed by the destructive distillation of the rubber binder is greater than that of the plastic resins.

Buffalo-Ontario International Meeting

The eighteenth annual international meeting of the Buffalo and Ontario Rubber groups was held in the Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, May 1. With this meeting following directly after the CIC Rubber Division's annual conference held in the same hotel during the day (see report in this issue) it enabled those in attendance to enjoy meetings of two related organizations in less than 24 hours. About 350 members and guests attended this dinner-meeting and the preceding cocktail hour, including many who attended the CIC meeting.

Speaker at the dinner-meeting was Robert V. Yohe, president, B. F. Goodrich Canada, Ltd., who discussed "Productivity—Problem or Solution." Mr. Yohe called upon all industries and both labor and management to promote productivity as a means for Canadian and United States business to remain competitive. He suggested that the rewards of productivity should be shared by labor, the consumer, and industry. He said further that improved productivity means less human sweat and is generally increased through investment in better, more efficient plants, better machinery, methods, and processes, and better and more effective scheduling.

Mr. Yohe said he could understand the apprehension of labor toward productivity resulting in a short-term loss of jobs and an increase in the percentage of white-collar workers, but that it would be necessary for labor leaders to back up their stated acceptance of increased productivity with action. He felt that it would be unfortunate if the economic health were to be crucified on the cross of self-interest for the lack of at least one labor leader who would dare to preach a gospel contrary to the labor-boss line.

Buffalo and Ontario Rubber groups' international meeting included *(left to right)*: E. R. Rowzee, president, Polymer Corp., Ltd.; dinner-speaker, Robert V. Yohe, president, Goodrich Canada; Ontario RG chairman, Carl Croakman, Columbian Carbon, Canada; Buffalo RG chairman, R. J. Herdlein, Hewitt-Robins Inc.; and chairman of Rubber Division, ACS, E. H. Krismann, E. I. du Pont de Nemours & Co., Inc.

CIC Rubber Division Holds Conference at Niagara Falls

The annual conference of the Division of Rubber Chemistry of the Chemical Institute of Canada was held in the Sheraton-Brock Hotel, Niagara Falls, Ont., on May 1, with about 150 in attendance. After a morning coffee hour sponsored by the Division, the meeting consisted of two technical sessions. The morning session contained four papers on general subjects and new elastomers, and the afternoon session featured a symposium on "Aging and Weathering of Elastomers." The two meetings were broken at noon with a very pleasant divisional luncheon held in the tenth floor salon of the hotel overlooking Niagara Falls.

The morning group had C. M. Croakman, Columbian Carbon (Canada), Ltd., as chairman; and the papers were: **"Chemical Nature of Filler Reinforcement,"** by M. C. Brooks, F. W. Boggs, and R. H. Ewart, United States Rubber Co., New York, N. Y.; **"Some Results of Kinetic Studies of Sulfur Vulcanization in the Presence of Accelerators,"** by Otto Lorenz, research division, Goodyear Tire & Rubber Co., Akron, O.; **"Silicone Rubber Developments,"** by Philip C. Servais, Dow Corning Corp., Midland, Mich.; and **"A New Chlorine Containing Butyl Polymer,"** by R. E. Clayton, J. V. Fusco, L. T. Eby, Enjay Co., New York.

The afternoon symposium was moderated by J. M. Campbell, Northern Electric Co., Lachine, P.Q., and consisted of the following papers: **"Theory and Practice of Antiozonant Usage,"** by Thomas H. Newby, Naugatuck Chemical Division, U. S. Rubber, Naugatuck, Conn.; **"Aging of Rubber: Effects of Metal Contamination,"** by B. N. Leyland and R. L. Stafford, Imperial Chemical Industries, Ltd., Manchester, England; **"Development of a Low Temperature Antichecking Wax,"** by S. W. Ferris and J. S. Sweely, Sun Oil Co., Marcus Hook, Pa.; **"A Quantitative Ozone Test for Small Specimens,"** by D. C. Edwards and E. B. Storey, Polymer Corp., Ltd., Sarnia, Ont.; and **"Antiozonants in Tire Sidewalls,"** by J. M. Willis and C. Alliger, Firestone Tire & Rubber Co., Akron.

Morning Session

Mr. Brooks discussed the results of the filler reinforcement study made at the U. S. Rubber research center. He stated that an experimental study was designed to establish the effect of the chemical nature of filler surface on reinforcement properties. The surface of silica fillers was modified by reaction with organosilanes. It was demonstrated that chemical bonding could be achieved and was necessary to get reinforcement similar to that obtained by carbon black. Vinyl and allyl unsaturation on the filler surface was found to bring about maximum reinforcement in *Hevea* rubber and SBR, but the less reactive cyclohexenyl unsaturation brought maximum reinforcement in butyl rubber.

Some of the results of this filler modification are improvement of vulcanizate performance in connection with increased modulus, increased tensile strength particularly at high temperature, lower permanent set, improved abrasion resistance, better resistance to fatigue, and lower hysteresis.

Practical methods of obtaining these improvements have been developed through the use of compounding agents which react with the surfaces of the fillers during normal processing. These agents were described, and the announcement was made that they were being considered for commercial production and sale.

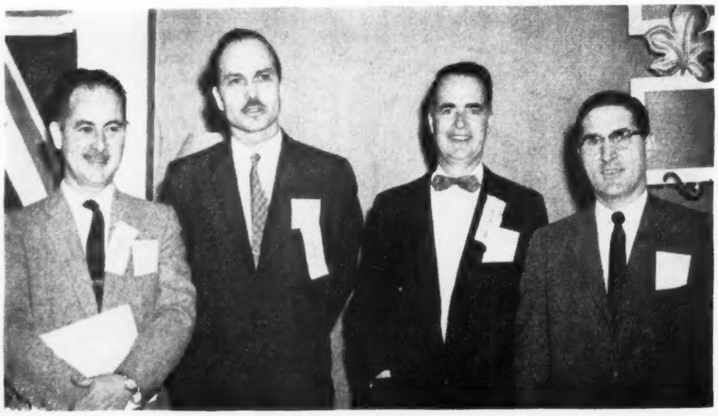
In reporting the results of his kinetic studies, Dr. Lorenz started with a short survey of the different sulfur bonds formed during vulcanization. He then mentioned two methods for determining polysulfides in rubber vulcanizates: (a) reduction under suitable conditions (e.g., with lithium aluminum hydride), or (b) isotope exchange reaction. The dependence on the amount of polysulfidic sulfur was discussed in relation to (a) the nature of the accelerator, (b) the time of vulcanization, and (c) the temperature of vulcanization. He pointed out that basic accelerators such as diphenylguanidine form more polysulfides than mercaptobenzothiazole or its derivatives. The amount of polysulfides is a function of the vulcanization and goes through a maximum, showing that polysulfides are transformed into more stable compounds during the further course of the vulcanization. No polysulfides are formed when thiuram disulfides are used as vulcanizing agents in the absence of sulfur.

The formation of zinc sulfide during cure was discussed, and it was stated that zinc-containing intermediates are formed. Portions of these intermediates are presumably zinc-containing cross-links which form zinc sulfide and more stable sulfur linkages.

A review of the properties, processing, growth, and many of the applications of silicone rubber were made by Mr. Servais. He reported that silicone rubber has been available for 15 years and is sold in many countries. He pointed out the unique resistance to heat, cold, and weathering for which these types of elastomers are known.

He suggested that there is no limit to the ways in which silicone rubber can be used by the designer. He pointed out the many uses now being made in seals, ovens, appliances, aircraft, buildings, missiles, and an increasing use by surgeons in making synthetic valves, drains, and arteries for use in operations. The good electrical properties have also provided incentive for quite a bit of use in wire, electrical motor and generator insulations and encapsulation.

R. E. Clayton delivered the talk on the new chloro-butyl polymer. He pointed out that the physical and chemical properties of butyl rubber have been markedly enhanced by the introduction of chlorine into the molecular structure. This modification gives improved compatibility with other



The CIC Rubber Division conference committee included *(left to right)*: W. H. Bechtel, vice chairman, J. A. Carr, Division chairman, Harry Hencher, committeeman, and T. L. Davies, Rubber Division's councillor

elastomers, faster cure rate, and greater stability of its vulcanizates to heat. It retains the low gas permeability and ozone resistance of butyl.

The presence of both chlorine and unsaturation in the chain allows the use of a greater variety of vulcanizing agents and explains the faster cure rate. Several cure systems may be used that were not suitable for the elastomer which contained no halogen. The new polymer is practical with respect to cost and processability, and the compounding and applications of the material were discussed.

Aging Symposium

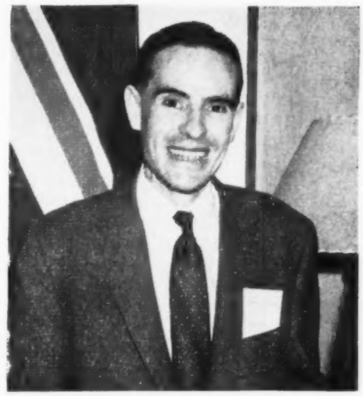
Starting the symposium on aging, **T. H. Newby reported that the deterioration of all types of stressed rubber goods** is a well-known phenomenon, and that it is most familiar to the public in the form of cracks in tires and molded rubber goods such as hoses, covered wire, automotive weatherstripping, etc.

He did say, however, that great advances have been made in the past few years in understanding the way in which ozone attacks rubber goods. A number of new chemicals has been made commercially available which do an excellent job in preventing or delaying rubber deterioration due to ozone.

The speaker went on to describe new theories of antiozonant protection and mentioned a few specific antiozonants which are now available for rubber protection.

Dr. Stafford discussed metal contamination in rubber and its effect on aging and some studies made on this problem in England. He stated that the prooxidant effect of even small amounts (20-100 parts per million) of some metals in raw rubbers, when included as the salts of weak organic acids, is demonstrated by oxygen-absorption measurements. He called attention to differences in the behavior of raw natural rubber as compared to SBR rubber.

He reported that both zinc diethyldithiocarbamate and tetramethyl thiuram disulfide inhibit the metal-catalyzed oxidation of raw rubbers, but that they could not be used with sulfur vulcanized elastomers. A different type of inhibitor is therefore required. He stated that the study has led to the development of a metal-inhibitor which is a non-staining metal inhibitor and at the same time is a non-staining antioxidant effective in the presence or absence of metal contamination.



R. L. Stafford, Manchester, England, addressed the Conference on the effect of metal contamination on ozone attack on rubber

The use of wax to protect rubber from ozone attack has been practiced for quite some time, but in low-temperature service the film of wax which has bloomed to the surface becomes brittle and makes it difficult to protect the rubber. **Mr. Ferris reported a study made by Sun to find a good low-temperature wax** for ozone protection. A rubber formulation was chosen which most waxes failed to protect at low temperatures. This recipe was tested with various loadings of a number of narrow fractions of petroleum wax. Results were correlated by means of melting point and refractive index at 212° F. of the waxes. With this correlation as a guide, a blend of commercial waxes was made which gave excellent protection in cabinet exposure with 25 pphm of ozone at 120° F. and 0° F. and also year-round outdoor exposure.

An explanation of Polymer's ozone test was made by E. B. Storey. This test method measures the movement that occurs when two equal specimens, one protected by a loose-fitting polyethylene sleeve, and one unprotected, are mounted in series and exposed to ozonized air. The method was reported to be simple and to use small, easily prepared samples, but produces quantitative data. The effective depth of cracks in the unprotected specimen was estimated and was found to increase linearly with time for cases where the number of cracks was large. Storey illustrated the results of tests made showing the distinction between "hot" and "cold" polymerized SBR and the effect of raw polymer unsaturation and the state of cure on the ozone resistance of butyl rubber vulcanizates.

J. M. Willis reported the results of a Firestone study on antiozonants in tire sidewalls. He gave the reasons for the study as twofold: first, to test substituted p-phenylenediamines in tire sidewalls under normal conditions with a blend of conventional antioxidants and to a substituted dihydroquinoline-type antiozonant; and, secondly, to correlate service tests with laboratory ozone exposure results. The speaker said that they found good results for the p-phenylenediamine in SBR sidewalls, but that the effect was less pronounced in natural rubber sidewalls.

In a test where the tires were aged for two years before they were run, they found that ozone protection dropped off greatly and was only equal to or less than the antioxidants tested that show little or no ozone resistivity. The use of a static tire test was found to give different types of cracks and is thus not recommended for general use.

Good correlation between service tests of tire sidewalls and laboratory ozone exposure of the stocks in a Weather-Ometer is excellent, particularly if the laboratory test is run on a combined static dynamic basis according to the author.

Some of the speakers at the CIC Rubber Division annual conference were *(left to right)*: J. M. Willis, S. W. Ferris, E. B. Storey, T. H. Newby, M. C. Brooks, and P. C. Servais

Many Ballot Results Reported by SAE-ASTM Tech A in March

At the meeting of the SAE-ASTM Technical Committee on Automotive Rubber held in Detroit, Mich., on March 10 and 11 the following business was conducted. The method of including the large amount of tear resistance data commercially available in ASTM D 735-SAE 10-R (Specification for Elastomer Compounds for Automotive Compounds) was again discussed. It had been suggested in the December meeting that it appear on the back of the "key" or fly-leaf. In this meeting, however, it was suggested that the data be handled as it is in MIL Standard 417 [Rubber Compositions, Vulcanized, General Purpose Solid (Symbols and Tests)], and the matter was handled by passing the following motion:

"To request Subsection IV-V to consider the approach used in MIL Standard 417 with respect to values for Suffix G on Tear Resistance, and to make such a change in Paragraph 5i of ASTM D 735-SAE 10-R rather than to add the information in the key."

In the consideration of automotive sponge there was considerable discussion on nomenclature. The history of the development of the present types and grades of foam and sponge for ASTM D 735 was given. A major problem is the necessity of avoiding conflicts in the preparation of specification tables. An alternate method of nomenclature was suggested which uses prefix letters to designate the type of sponge, followed by two digits to designate the indentation grade. There would be one set of prefix letters for foam and another set for sponge. It was agreed that the urethane tables should be completed before a reorganization of all cellular elastomers is undertaken. The three types of foam and sponge: namely, rubber, vinyl, and urethane, should not be lumped together in any nomenclature system, nor should they be tested by the same methods.

The scope of the subsection on new specification format was expanded to include working on the Department of Defense coordination program with an immediate assignment to translate into the language of the new format the 220 grades of rubber products needed by the Department of Defense.

Although no meeting of the compression set subsection was held, the results of a letter-ballot on the proposal to reduce the time from 70 to 22 hours were announced. The ballot produced 26 yes and one no votes. The no vote was overriden. Notice was taken, however, of a desire by the Ordnance Department to retain the 70-hour test period. It was agreed that the new specification format would allow a consumer to specify a 70-hour test by use of a suffix number requirement.

New Stress Relaxation Section

The first meeting of the subsection on stress relaxation of elastomeric compounds was held. A bibliography of stress relaxation of elastomers was compiled and distributed by the chairman, P. Weiss, General Motors Corp. Definitions of stress relaxation and creep will also be compiled. In selecting a test method this subsection will investigate effects of time and temperature. Several companies will submit methods involving testing either in compression or tension.

All of the replies of members of Section IV concerning the revised table IV on Type R, Class RS materials of Military Standard 417, indicated acceptance of the use of 70 hours at 158° F. for the basic oven-aging test, with the inclusion of suffix A-1 for a 70-hour test at 212° F.

Data from current round-robin tests on acrylic elastomers were reviewed with the result that the committee arrived at values for a tentative new Table VI of ASTM D 735. Three grade numbers will be included, TB-614, TB-715, and TB-816. These values will replace the current 60, 70, and 80 durometer compounds in Table VI. A questionnaire is to be circulated among the membership regarding the need of other TB specifications.

Impact Machine Sought

Much discussion of the merits of the two types of impact test machines was held in the impact testing subsection. There is a vertical falling weight type, but the newest proposal is the double pendulum type with impact occurring in the horizontal direction between two swinging pendulums. This was proposed by Mast Development Co., Davenport, Iowa, and approved by the committee. The prototype will cost about $5,000, and methods for raising the necessary funds will be discussed in June.

The committee reviewed Table III for Type S compounds, Class SB, Oil Resistant, with the view of bringing the table into close agreement with MIL-STD-417, and also to streamline the table by elimination of grade numbers not widely used. A letter-ballot will be sent out on the many matters concerned with these changes.

The fluid aging subsection reviewed the data from recent round-robin plus all previous work on gear lubricants. It was agreed that the large number of variables makes it impossible to draw many hard and fast conclusions, but that the work would be of great value to guiding end-users in the selection of seal stock to be used with any particular type of gear lubricant. The stressing of samples during immersion was reported to have a negligible effect on the seal material. A round-robin will be run on transmission fluids using five fluids and four seal stocks of Hycar 4021,[1] nitrile (NBR) rubber, "Viton" A,[2] and silicone. Periods of immersion will be 70 hours at 300° F. and 498 hours at 250° F. Future studies recommended include trans-axle fluids and universal hydraulic fluids.

Round-robins being conducted by the subsection on Bond After Vulcanization have brought to light new values for adhesion, using the same materials as previously, but with improved techniques. Work will continue to try to eliminate the variations which appear from piece to piece and from laboratory to laboratory. Work will be done with an SBR Type R 715 compound.

Test results on automotive-mat tear test program were reported by four producers and two auto companies. The die B results were higher and more uniform than for die C and are therefore preferred. No values for tear were adopted by the committee. It was reported that in order to get reliable tear tests the samples must come from the flat portion of the mat.

Letter-Ballots Reported

Reports on some letter-ballots are:

The gasket section is balloting on 10 materials for possible inclusion in ASTM D 1170 (Specification for Non-Metallic Gasket Materials for General Automotive and Aeronautical Purposes), according to the chairman, M. H. Kapps, F. D. Farnam Co.

The low-temperature stiffness test section reported on a ballot concerning the adoption of the Gehman method (ASTM D 1053-58T — Method of Measuring Low-Temperature Stiffening of Rubber and Rubber-Like Materials by Means of a Torsional Wire Apparatus) go or no go with a maximum Youngs modulus of 10,000 psi. at —40° F. for S_1 and —67° F. for S_2. Results were 20 yes votes and one no. The negative ballot could not be resolved, but a motion to override was carried.

On brittle temperature test the ballot on adoption of D 746 (Method of Test for Brittleness, Temperature of Plastics and Elastomers by Impact) to replace D 736 (Method of Test for Low-Temperature Brittleness of Rubber and Rubber-Like Materials) was 21 yes to five no. Method 736 had been discontinued many years ago, but subsequently was reinstated. After considerable discussion of the various factors involved the negative votes which could not be resolved were overridden.

Following a letter-ballot an additional grade of synthetic rubber, TA 512, was made part of Table V (Temperature Resistant Compounds).

[1]B. F. Goodrich Chemical Co., Cleveland, O.

[2]E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

AIEE R & P Division Holds Eleventh Annual Conference

The eleventh annual rubber and plastics conference of the American Institute of Electrical Engineers was held in Akron, O., April 22-24 at the Sheraton Hotel. This year's conference also included the meeting of the East Central District of the AIEE. These meetings preceded by less than a month the seventy-fifth anniversary luncheon of the parent AIEE held in New York, N. Y., at the Astor Hotel on May 13.

District Meeting and R & P Conference

About 300 electrical engineers and guests attended the Akron sessions with major theme of the conference being "Electricity — Major Tool of Industry." The themes of the individual rubber and plastic sessions were "Nylon Tire Cord Processing" on Wednesday morning; a session on calendering on Thursday morning, "Static Components" Thursday afternoon; "Plastics Extrusion" on Friday morning; "Trends in New Machines and Processes" and "Rubber and Plastics Working Committee Reports" on Friday afternoon.

Walter H. Sammis, Ohio Edison Co., Akron, was general chairman of the joint meeting; while Edwin L. Smith, Firestone Tire & Rubber Co., Akron, was chairman of the Rubber and Plastics Conference.

R & P Conference Papers

Some of the points brought out during the Rubber and Plastics Conference sessions which are considered of interest to general RUBBER WORLD readers were included in the papers which are reviewed here briefly. Harold P. Lamb, Adamson United Co., Akron, started the Friday afternoon meeting with a talk on **"Trends in New Machines and Processes."** Mr. Lamb stated that machinery incorporating labor savings, safety, accuracy, quality, capacity, and reduction in cost can be designed by use of clever and novel ideas, and that this must be done to meet the demands of labor, insurance regulations, laws, and court judgments among others. In curing, the dream is to make a flat, continuous press. While some headway has been made with new machines, there is still a long way to go. New heaters are also being designed.

The need of improved machines was shown in areas of tire testing, roll bending, and internal mixing as well as for many associated processes in the rubber and the plastics field and machines common to many fields. One point made by the speaker is that the necessary well trained and educated people to keep the automated plant operating are not being developed fast enough to keep up with proposed machines. The problems of union maintenance agreements and their effect upon the proper service of the new electronic controlled machines must be worked out. The current system of relying mostly upon outside sources such as the equipment supplier or electrical contractors for such service will not be satisfactory in the highly automated factory. The necessary personnel to maintain these machines will have to be part of the company's work force.

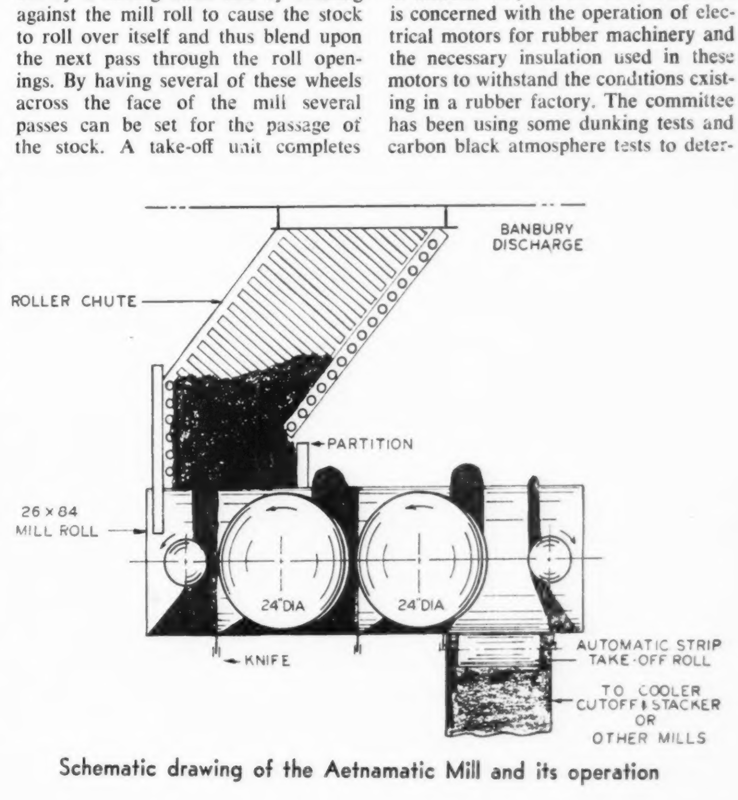
A modified rubber mill designated the **Aetnamatic Mill** by Aetna-Standard Engineering Co., was described by R. Cloyd Rogers, Hale & Kullgren, Akron. The stated uniqueness of this mill lies in auxiliary mechanisms which direct and control the travel of the material around and through the mill rolls. These mechanisms may be installed on either standard existing mills or on vastly modified new mills. These mills are used for batch-off or sheeting mills or for warm-up or plasticizing for preconditioning for extrusion or calendering.

The basic unit of this system is the use of curling wheels on the mill to take a strip of stock which has been cut by a slitting knife and by rotating against the mill roll to cause the stock to roll over itself and thus blend upon the next pass through the roll openings. By having several of these wheels across the face of the mill several passes can be set for the passage of the stock. A take-off unit completes the unit. All features are patented.

It is claimed that the Aetnamatic Mill makes possible the following: (1) to have a continuous flow of stock through the mill with exactly the same amount of milling on each increment of the material; (2) this will give a uniformly blended material at the same temperature or plasticity; (3) it will provide a labor saving; (4) the ability to run with roll surface speeds up to about 300 fpm. will permit greater production and/or a thinner strip to allow more cooling or drying; (5) the controlled advancing of stock on mill allows its use in working thermosetting materials; (6) use of a faster mill and a better blending on the mill permits a shorter Banbury cycle; and (7) this feeding mill will give a continuous strip at the same plasticity.

A report on the **use of high-energy electron radiation to cure rubber** was made by Dale J. Harmon, B. F. Goodrich Research Center, Brecksville, O. This work has been previously reported to the rubber chemists and concerns the studies in four main fields, i.e., radiation induced polymerization, graft polymerization, cross-linking of plastic materials, and vulcanization of elastomers.

The working committee considering **problems due to atmospheric contamination of electric motors** made its report to the meeting. This report was made by Jack C. Hall, Goodyear Tire & Rubber Co., Akron. This committee is concerned with the operation of electrical motors for rubber machinery and the necessary insulation used in these motors to withstand the conditions existing in a rubber factory. The committee has been using some dunking tests and carbon black atmosphere tests to deter-



Schematic drawing of the Aetnamatic Mill and its operation

mine the life expectancy of motors in these applications. One major task of the committee is to compile and catalog the reported failures of motors during the year and determine the major causes. This study is hampered very much, however, by the lack of cooperation in the rubber industry. Most of the figures available are representative of a very small number of rubber plants in the country. A major problem is to increase the number of reporting plants, and any ideas on how this may be accomplished would be very welcome by the committee.

The working committee on **standards for the rubber and plastics industries** also reported through William S. Watkins, Ohio Rubber Co., Willoughby, O. This committee has recommended a standard called "Proposed Recommended Practices for Medium-Voltage Motor Controllers for Rubber and Plastics Industries." It is proposed to submit this to the AIEE Standards Committee as a "Recommended Practice" as described in Division III, Section I, of the AIEE Standards Manual.

AIEE Seventy-Fifth Anniversary

The seventy-fifth anniversary af the founding of AIEE was celebrated at the luncheon in New York. About 500 attended the lunch and heard L. F. Hickernell, president of AIEE, give a brief history of the Institute, and also heard a talk by W. P. Marshall, Western Union Telegraph Co.

Northeastern E & P Group Concludes Season

The Elastomer & Plastics Group of the Northeastern Section, ACS, held its last meeting of the season on May 19 at Science Park, Charles River Dam, Boston, Mass. The meeting was the eighth annual Short Talks Symposium, and about 100 members and guests heard the four speakers and enjoyed the cocktail hour and dinner.

The first speaker was Richard V. Does, General Latex & Chemical Co., Cambridge, Mass., who discussed **"Latex in Concrete."** Mr. Does covered the present state of the art of incorporating latex in various types of concrete to increase strength, adhesion, abrasion and impact resistance; water, chemical, and solvent resistance; flexural and compressive strength, and possibilities for thinner sections and feather edges in building. The retardation effect of the latex on concrete cure and the latex moisture being consumed in the hydration of the matrix mean that such concretes can be formed between nonporous surfaces with good adhesion to these surfaces. The use of Portland, calcium aluminate, and terrazzo-type concretes has been greatly expanded through the use of latex additions. The latex employed is determined by the type and temperature of service or other characteristics required of the finished product.

Some current uses for latex-modified concrete are ships' decks, non-skid aisles and heavy-duty floors, conductive flooring, concrete repairs, stairways, colored skimcoats, setting tiles or bricks, protective coatings, terrazzo floors, and floor underlays.

"Polypropylene — Properties and Uses" was the topic of Joseph J. Coughlan, Hercules Powder Co., Wilmington, Del. He discussed these properties in terms of Hercules' Pro-Fax polypropylene. He compared this polypropylene with polyethylenes (both low and high density), with cellulosics, polystyrene, and nylon, in all mechanical and chemical properties. The advantages of polypropylene were indicated as resulting from its lower specific gravity, its high crystallization and heat-distortion temperatures, the balance between tensile strength and elongation, lack of stress-cracking tendencies, low-temperature flexibility and high enthalpy.

Applications include oven-resistant dishware, watermixing valve bodies, chemical sprayers, hospital ware, refrigerator trays, bristles, fan blades boat propellers, electrical moldings, and food wrappings. A sample Pro-Fax dish cleaner was presented to each person present.

"Polyurethane Coatings for Leather" by Paul J. Maloney, U.B.S. Chemical Co., Cambridge, was the third paper. Mr. Maloney discussed the development of high-gloss, abrasion-resistant polyurethane substitutes for patent leather. He spoke of the five main reactions common to urethanes and the four types of coatings possible; these latter are prepolymers, isocyanate adducts, blocked isocyanates, and urethane oils. The advantages and disadvantages of each type of coating were presented. For leather finishes the prepolymer and isocyanate adducts are generally used. The many possibilities in base properties mean an infinite number of variations in the properties of the finished coatings.

The biggest problem in the field is the roughness of the leather substrate. Surface sealers are used to level the finished product. The speaker professed a liking for the all-urethane system, but said that conventional linseed varnish undercoats have usually been used. He also preferred an all-spray application system. Some figures on tests were given which indicate some very greatly improved lasting qualities over patent leather. Resistance to light degradation was much improved; flex life was much longer; and a use test in an orphanage showed superior service life for the urethane coating over patent leather in an eight-week evaluation. An unexpected bonus was about four times better breatheability of these coatings, according to the speaker.

The final topic was **"Blowing Agents for Elastomers and Plastics,"** by Henry A. Hill, National Polychemicals, Inc., Wilmington, Mass. This discussion covered a history of early blowing agents and their development up to the present when very light or very heavy densities of sponge can be produced chemically from the same matrix. Dr. Hill also spoke of the mechanical or whipping process of foaming. Included was the fact that both open- and closed-cell structure is possible today in such unlikely materials as aluminum, glass, silicon carbide, and concrete as well as rubbers.

The speaker indicated that some of the reasons for blown products are to reduce density, provide damping materials (mechanical and acoustical as well as thermal), buoyancy, improved dielectric properties, and increased capillarity. He stated that there could be no one ideal blowing agent, since end-use, finished properties, materials blown, etc. all required special consideration when the system to be used is being designed.

A discussion of some of the modern blowing agents such as p-tert.-butylbenzoylazide, the borohydrides, silicon hydrides, and other inorganic hydrogen-producers was given. The speaker felt that most products today would benefit from being "sponged" to about 10-15%, perhaps with nitrogen, and described wire coating as an example, where the slightly blown coating improved electrical properties as well as costing less. Fire and atomic heat-resistant paints or coatings, marine coatings, insulation, and foamed latex concrete were a few other applications that should benefit from sponging, according to the speaker.

Plan Symposium for '60

The second International Synthetic Rubber Symposium will be held at Church House, Westminster, London, England, on October 11-13, 1960. Lectures will be presented by experts from North America, Great Britain, and Western Europe. The full lecture program will be announced in due course, and further particulars may, in the meantime, be obtained from *Rubber and Plastics Age,* Gaywood House, Great Peter St., London, S.W.1, England.

Gordon Research Polymer And Elastomer Conferences

The Gordon Research Conferences for 1959 will be held from June 15 to September 4 at Colby Junior College, New London; New Hampton School, New Hampton; and Kimball Union Academy, Meriden, all in New Hampshire.

These Conferences were established to stimulate research in universities, research foundations, and industrial laboratories. They consist of informal-type group meetings with scheduled lectures and discussion groups. The conference for any particular branch of research runs for a week from Monday to Friday. Requests for attendance or further information should be addressed to the Conference Director, W. George Parks, University of Rhode Island, Kingston, R. I.

Two conferences of major interest to RUBBER WORLD readers are the sessions on polymers to be held the week of July 6-10 and the elastomer conference to be held the week of August 10-14. Both of these sessions will take place at the Colby Junior College.

The programs of these conferences follow.

Polymer Conference

JULY 6—NEW POLYMERS. **"New Developments in the Field of High Polymers,"** by H. F. Mark, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.; **"Research into Extreme-Preformance Polymers,"** L. W. Butz, Department of the Navy, Office of Naval Research, Washington, D. C., A. M. Lovelace, Wright Air Development Center, Wright-Patterson Air Force Base, O., and J. C. Montermoso, Department of the Army, Office of the Quartermaster General, Natick, Mass.; **"Pyroceram,"** P. Goodman, Corning Glass Works, Corning, N. Y.; **"Linear Phosphinoborine Polymers,"** F. P. Caserio, American Potash & Chemical Corp., Whittier, Calif.; and the discussion leaders will be W. F. Busse, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and W. C. Fernelius, The Pennsylvania State University, University Park, Pa.

JULY 7—FREE RADICALS. **"Recent Developments in Free Radical Chemistry,"** by C. Walling, Columbia University, New York, N. Y.; **"Patterns of Free Radical Reactivity,"** A. D. Jenkins, Courtaulds, Ltd., Maidenhead, Berks., England; **"Solution Polymerization of p-Xylene,"** L. A. Errede, Minnesota Mining & Mfg. Co., St. Paul, Minn.; with M. Szwarc, Syracuse University, Syracuse, N. Y., and W. E. Cass, Arthur D. Little, Inc., Cambridge, Mass., serving as discussion leaders.

JULY 8—IONIC POLYMERIZATION. **"Stereospecific Polymerization of Olefins,"** by A. V. Topchiev, USSR Academy of Sciences, Leninski, Prospect 14, Moscow, USSR; **"Polymers from Diazoalkanes; Mechanisms and Stereospecificity,"** A. Nasini, Del'Universita di Torino, Torino, Italy; **"Polymerization of Diazo Compounds with Boron Catalysts,"** by C. E. H. Bawn, University of Liverpool, Liverpool, England; **"Mechanism of the Anionic Polymerization of Methyl Methacrylate,"** D. L. Glusker, Rohm & Hass Co., Philadelphia, Pa.; and discussion leaders, D. Pepper, University of Dublin, Dublin, Eire, and C. G. Overberger, Polytechnic Institute of Brooklyn.

JULY 9—SOLID STATE. **"The Para-Crystalline Structure of High Polymers,"** by H. A. Stuart, University of Mainz, Mainz, Germany; **"Dielectric Absorption in Semi-Crystalline Polymers,"** J. D. Hoffman, National Bureau of Standards, Washington; **"The Nature of the Spherulites in Polyethylene,"** F. Price, General Electric Co., Schenectady, N. Y.; with discussion leaders, J. J. Hermans, Syracuse University, and J. H. Gibbs, American Viscose Corp., Marcus Hook, Pa.

JULY 10—STRUCTURE AND BEHAVIOR. **"Optical Studies of Amorphous Polymers,"** by E. F. Gurnee, Dow Chemical Co., Midland, Mich.; **"The Effect of Molecular Weight Distribution on the Mechanical Properties of Polystyrene,"** H. W. McCormick, Dow Chemical; **"The Ultimate Properties of Amorphous Polymers;"** T. Smith, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.; with A. Bueche, General Electric, as discussion leader.

Elastomers Conference

AUGUST 10. **"A New Technique for Measuring Volume Swell and Its Application to Elastomer Studies,"** by J. P. Buckley and M. Berger, Esso Research & Engineering Co., Linden, N. J.; **"Relation of Structures to Properties in Polyurethane,"** E. F. Cluff and E. K. Gladding, Du Pont; **"Frictional Properties of Flexible Vinyl Polymers,"** R. Norman, The Research Association of British Rubber Manufacturers, Shrewsbury, Shropshire, England.

AUGUST 11. **"The Attrition of Carbon Black: Surface Chemistry and Reinforcing Effects,"** by A. M. Gessler, Esso Research; **"Properties of Attrited Carbon Black,"** E. M. Dannenburg, Godfrey L. Cabot, Inc., Cambridge, Mass.; **"Elastomers for High-Temperature Services,"** by E. R. Bartholomew, Wright-Patterson Air Force Base.

AUGUST 12. **"Observations on Tire Performance,"** by R. D. Stiehler, NBS; **"Resilience and Power Loss of Elastomers,"** A. D. Dingle *et al.*, Dunlop Research Center, Toronto, Ont., Canada; **"Thermal and Oxidative Degradation of Carbon Black Reinforced Vulcanizates,"** Gerard Kraus, Phillips Petroleum Co., Bartlesville, Okla.

AUGUST 13. **"Collodial Properties of Synthetic Latices,"** by C. F. Fryling, Verona Research Center, Koppers Co., Inc., Verona, Pa.; **"Carbon Gel Formation in Adiprene,"** by Kurt L. Seligman, Du Pont.

AUGUST 14. **"Vinylic Filler Reinforcement of Elastomers,"** by Oliver Burke and Eldon Stahley, Burke Research Co., Van Dyke, Mich.

Ontario RG Elections

The Ontario Rubber Group heard a talk on curing systems by A. R. Davis at the annual election meeting held in the Pickfair Restaurant, Mimico, Ont., Canada, on April 7. About 130 members and guests attended the affair, which included a social hour with American Cyanamid, Bound Brook, N. J., and St. Lawrence Chemical Co., Montreal, P.Q., as hosts.

The slate of officers, as reported by the nominating committee, was elected by acclamation and is as follows: chairman, R. R. Tartaglia, B. F. Goodrich of Canada; vice chairman, D. G. Seymour, Cabot Carbon of Canada; secretary, W. R. Smith, Dominion Rubber Co., Ltd.; and treasurer, Lloyd Lomas, St. Lawrence Chemical Co.

The address by Mr. Davis, American Cyanamid Co., covered very completely the subject of "Curing Systems." The topic was attacked from several angles. First, there was a brief section on non-sulfur cures, what they are, and some of the elastomers which particularly lend themselves to such cures. The major effort, however, was devoted to the sulfur-cure systems. In discussing accelerators and activators for sulfur cures, Mr. Davis quoted the tariff figures to show that more than 51 million pounds of accelerators were sold in the United States last year.

The report continued a discussion of accelerators by classifying them into seven classes as follows: (I) aldehyde-amines; (II) guanidines; (III) thiazoles; (IV) thiazolines; (V) thiuram sulfides; (VI) dithiocarbamates; and (VII) mercaptoimidazolines. These seven classes were expanded with illustrations and uses; then the report was concluded with sections on secondary accelerators, sulfur-bearing materials, and retarders.

PRG Discusses Sponge Developments

A symposium on sponge products and processes was the theme of the Philadelphia Rubber Group meeting on May 1 held at the Poor Richard Club, Philadelphia, Pa. About 200 members and guests attended the dinner-meeting, which followed the technical discussion. After-dinner activities consisted of two motion pictures. Chairman Ralph Craft presided.

The sponge session was moderated by Derek Angier, American Foam Rubber Co., Burlington, N. J., who in his introductory remarks explained briefly the terms "sponge," "foam," and "expanded rubber." He noted that natural sponges had been used for many years, but that this meeting was concerned with the man-made products. He also listed a few of the basic materials used to make foams, such as natural or SBR latices or combinations of both as well as neoprene and NBR rubbers.

The moderator also included a discussion of the urethane foams, both polyesters and polyethers, which can be made by either prepolymer or "one-shot" methods.

His comment on anticipated production of flexible foams this year indicated a total of up to 235 million pounds of the most common types. Angier further noted the fact that a highly competitive situation exists between urethane and natural foam for such things as seating and bedding. He added that the competition should be a good thing, and that if sanity is maintained in pricing and manufacturing, the manufacturers should benefit by making the public more foam-conscious.

"Recent Developments in Expanded Rubber" was the subject of the talk by George R. Sprague, The B. F. Goodrich Co., Shelton, Conn. He broke down the products of the industry into three categories: *foam*—made from a liquid system generally having a larger degree of open (interconnecting) cells; foams may be made of natural or synthetic latex, of vinyl plastisol, or of urethanes (polyester or polyether); *sponge*—made essentially from a rubbery elastomer processed on conventional dry rubber equipment and having a large degree of interconnecting cells; *expanded products*—consisting of a majority of closed (non-interconnecting) cells which may be made from a liquid system as vinyl plastisols or rubbery polymers as used in making sponge.

Recent development in the field of expanded rubber may be classified into four categories: elastomeric materials, blowing agents, curing systems, and filler materials. Natural rubber was the main elastomer prior to World War II, but the selection was expanded to SBR, neoprene, acrylonitrile, and butyl rubbers soon after the war. Today the silicone, Hypalon, polyacrylate, Viton A, and improved SBR elastomers also may be used to make good closed-cell material. Sprague stated that the greatest improvements in blowing agents have been in the nitrogen generating chemicals used in closed-cell work. Newer chemicals provide improved cell size, less odor, non-staining properties; they are more economical.

In curing sytems, the speaker listed the many non-sulfur agents available particularly for many of the newer elastomers which have been used to make closed-cell products with many different properties and give the chemist a new approach to many of his problems. The use of new fillers and different combinations of fillers also was suggested as having played a great role in improving products such as expanded shoe soling.

A final portion of this talk was used to present a brief résumé of some of the specialty elastomers and the place that they fill in closed-cell expanded rubber products.

"Latex Foam Sponge" was covered by Aaron L. Back, A. L. Back & Associates, West Chester, Pa. He said that latex foam got started in England about 1931 by using the Dunlop process, but development was held back by various technical difficulties. Latex foam made most of its greatest strides after the war and expanded into a $200-million annual business.

Back discussed the use of natural and synthetic latices and the proportions of each in current production. Newer developments in synthetic latices are expected to increase the percentage of their use in production. Most of the foam is made by the original Dunlop process, and a brief description of the process was given. The next most important process is the Talalay method. This uses a peroxide to blow the foam rather than a machine which whips in air, as in the Dunlop process. There are other processes and modifications of these two, but they account for only a small portion of the business.

Some of the physical and chemical properties of the foams were mentioned, and some reasons for use and uses were presented. The impending "battle" among natural latex foam, polyurethane, and vinyl foams was visualized as an adjustment in the applications served, with all of the foams growing in usage according to their capabilities. Thus, the speaker concluded, the story of foam is "To be continued."

"Urethane Foam in Curtain Wall Construction" was the subject of the paper by M. Glickman, American Bridge Division, United States Steel Corp., Pittsburgh, Pa. In discussing this particular use-application of a foam, the speaker gave a little history and description of the curtain wall. It is a wall that is insulated and is a non-load-bearing shield or screen that encloses previously erected structural framework. Two major types of curtain wall are used. The stressed skin panel and the framed panel. The sandwich panel is in the stressed skin panel type and includes the use of urethane for the "filling." The framed panel has metal skins attached to frames by mechanical fasteners and has insulating material, generally fibrous glass or mineral wool, placed between the sheets. Design engineers and architects who prefer flat panels have been turning more and more to the stressed skin panel, however, with its core of honeycomb-type materials.

Many types of core materials have been tried, but most require glueing. The foamed-in-place cellular plastics have recently emerged as core materials. Glickman gave many of the features of the programs of development and testing which have been going on to achieve the best core materials and to insure that the urethane foams will serve the purpose. Because of the good results obtained in both field and laboratory investigations, urethane foams have been put on the market. A bank in the Harrisburg area used foam panels and has been satisfied with the results. This work to date indicates that urethane foam-filled steel faced panels are a real advance for curtain walls, but Glickman said that the search goes on for newer and better materials, and urethane will have to defend its position.

"Urethane Rigid Foams," by J. V. Borsellino, Thiokol Chemical Corp., Trenton, N. J., concluded the panel talks. While many people have been interested in using urethane foams as fillers or core materials, this speaker suggested using them without any wood, metal, plastic, or other substrate. He said it is possible to form a hard uniform surface during the molding operation and use this material by itself.

It was further suggested that possible uses of urethanes would some day include walls and shipping containers and in combination with such materials as polyethylene to make cups or plates for hot dishes. The fabrication of small parts will be done by injection molding. New urethane foam resins could be used as surface coatings applied by roller or by brush to improve sound properties, give a longer lasting surface, and be more pleasing to the eye. Borsellino also concluded that much of the story is still to be written as new developments continue to make great strides in new applications.

Chicago RG Fetes Lewis and Peterson

Maurice Morton addressing Chicago Rubber Group on its thirtieth anniversary

The thirtieth anniversary of the Chicago Rubber Group was celebrated by the Group at the regular meeting held at the Furniture Club, Chicago, Ill., April 24. A special feature of the "Graduation Night" meeting was the awarding of a desk set to Ben W. Lewis, Witco Chemical Co., for his devotion to the Group especially during its early years. Mr. Lewis served as secretary and treasurer for 12 years after the Group was organized and while the membership was small. He was instrumental in preventing the Group from disbanding during the depression years.

Also honored was Walter Peterson, Enjay Co., who was chairman of the Group in 1949 and has maintained his membership since that time, even though now located in New York. It is the custom of the Group to award honorary lifetime membership in such cases.

The guest speaker at the meeting was Maurice Morton, director of the Institute of Rubber Research and professor of polymer chemistry at the University of Akron, Akron, O. He discussed "Basic Research—A National Resource."

Diplomas were awarded to 16 rubber technologists who had successfully completed the Group's course in Basic Rubber Technology. Harold Stark, Dryden Rubber Division of Sheller Mfg. Co., coordinator of the course, announced that this was the most successful of the courses sponsored by the Group during the last eight years.

Results of the annual election of officers were announced. The new officers are: John Groot, Dryden Rubber Division, president; Stan F. Choate, Tumpeer Chemical Co., vice president; Ted C. Argue, Roth Rubber Co., secretary; and Russ A. Kurtz, E. I. du Pont de Nemours & Co., Inc., treasurer. The directors are: I. O. Nedjl, Ideal Roller & Mfg. Co.; Frank E. Smith, Williams-Bowman Rubber Co.; Dick Huhn, Harwick Standard Chemical Co.; John C. Ross, Jr., O'Connor & Co.; and Stan Shaw, Witco Chemical Co.

The Chicago Rubber Group will hold its annual golf outing at St. Andrews Country Club on July 24.

Walter H. Peterson (*left*) receiving honorary life membership from Mr. O'Connor on tenth anniversary of his serving as president of the Chicago Rubber Group

Ben W. Lewis (*right*) receiving desk set from M. J. O'Connor, chairman of the Chicago Rubber Group. Set is inscribed, "Presented to Ben W. Lewis in grateful appreciation of outstanding service. Chicago Rubber Group, Inc., April 24, 1959"

Offers Course at Akron

The Institute of Rubber Research and the Department of Chemistry of The University of Akron, Akron, O., are offering the fourth annual course, called "The Chemistry and Physics of Elastomers." The course, limited to 25 persons, is designed for scientists and engineers employed in industry or business. It will be held from August 17-22, and lectures will be given from 9:00 a.m. until noon and from 4:30 to 6:30 p.m. Laboratory meetings will occupy the afternoons from 1:30 to 4:30. All meetings will take place in Knight Hall, University of Akron.

The course schedule is: *Monday,* "Some Aspects of Tree Rubber," G. S. Whitby, "Chemistry of Synthetic Rubbers," M. Morton; *Tuesday,* "Chemistry of Synthetic Rubbers" *(continued); Wednesday,* "Physical Behavior of Elastomers: Elasticity Theory; Relaxation and Creep," J. P. Berry and K. W. Scott; *Thursday,* "Physical Behavior of Elastomers: Dynamic Properties," K. W. Scott; *Friday,* "Physical Behavior of Elastomers: Tensile Strength; Reinforcement," J. P. Berry; and *Saturday,* "Chemistry of Vulcanization," M. Morton.

The fee for the course is $150, payable at advanced registration, which will cover all expenses of the course and bound copies of summaries of the lectures, but will not include meals and housing expenses. Registrations are needed by July 20. The course director is Dr. Maurice Morton, University of Akron.

Tire Performance To Be Studied at Michigan

Improved performance of automobile tires is the objective of a fundamental research program by the College of Engineering at The University of Michigan, Ann Arbor, Mich., supported by five major tire manufacturers.

The University will conduct a basic study leading to an understanding of the dynamics of automobile tires and suspension systems, while the sponsoring companies will supply physical data from applied research and road tests. The ultimate result of the program could provide safer and more comfortable vehicles.

The companies which have contributed $31,000 for the first year's research are: The Firestone Tire & Rubber Co., The General Tire & Rubber Co., The B. F. Goodrich Co., and The Goodyear Tire & Rubber Co., all in Akron, O.; and United States Rubber Co., Detroit, Mich.

Particular attention will be directed to vibration and acoustical perform-

ance of tires. Other problems concerning tires and suspension systems to which additional basic research may be directed are those dealing with the mechanism of rolling resistance, skidding—the relative motion of the tire, and the road-and-tire strength and flexibility. While the primary area of the investigation is related to automobile tires, beneficial effects may result for heavier vehicles, including airplanes and military vehicles, intended mainly for off-the-highway use.

The results of this combined effort will be directed into University teaching programs where the undergraduate engineer is trained, into graduate programs where the student will participate in research, and into industry where the information obtained will be applied to products. This research will be done in the University's new automotive engineering laboratory, which was equipped largely by the automobile manufacturers. A liaison committee from industry has been appointed to the program.

Letters to the Editor

(Continued from page 342)

period was to produce a rubber having better physical properties than standard GR-S.

On page 102 you state "that Pfau had marked success with his laboratory experiments, but the research chiefs and higher echelons of B. F. Goodrich management were not interested in his findings." This is not true—as the results obtained were not encouraging, and no results were obtained indicating success in this project. Furthermore, this was a Goodrich sponsored project devoted to their own private interests, and they presumably would have been interested in exploiting any successful findings. As mentioned above, the last year I spent at Goodrich (1948 to February of 1949) I worked on other problems.

In the next paragraph, on page 102, it is stated "that Mr. Pfau would not abandon his project, instead, he went to General Tire & Rubber Co. to offer his services and ideas." The facts are as follows: (1) I learned that Dr. J. Abelard, head of the Polymerization Group at the Research Laboratory of General Tire & Rubber Co., had resigned to take a job in ordnance work; (2) I did not approach General Tire & Rubber Co. with any such worked-out idea as part of the reason for changing jobs; and (3) my main reason for transferring from Goodrich to General Tire & Rubber Co. is the same reason that prompts any man who believes there is a better opportunity in another company. At Goodrich I was a research chemist working in a group; at General Tire & Rubber Co. I would head a group in a company at an early stage in their growth into the chemical, plastics, and synthetic rubber fields.

I did not disclose to General Tire & Rubber Co. any specific information as to what I had been working on at Goodrich; and, furthermore, I was not asked. I was offered a job, accepted, and came to General Tire & Rubber Co. in March, 1949. When I started working at General Tire & Rubber Co., discussions were held on several possible projects. One of the problems being considered at General Tire & Rubber Co., prior to the time I came to General, was the possibility of making a very cheap stock for mechanical goods by employing a high Mooney rubber with very large amounts of plasticizer. This project was discussed with Mr. Swart and Mr. Weinstock, and work was started shortly after I came to General Tire & Rubber Co. The work for several months was directed primarily to this end, generally using ratios of rubber/oil of about 1/1. Neither Mr. Swart, Mr. Weinstock, or myself, who were involved in the planning and execution of the initial work, believed that the research would lead to anything but an inexpensive rubber stock having physical properties sufficient for products such as mat stocks. As the work progressed, other ratios of oil and black were tried. Out of the work a pattern finally evolved — a definite ratio of oil and black with a specific level of Mooney gave properties at least approaching the properties of normal GR-S. Work progressed to the point that finally tires were made. Skepticism still ran at a high level as it was believed that the oil would be expelled and that the treads would separate from the carcass.

I believe that the reason why the process was not discovered at Goodrich, but was discovered at General Tire & Rubber Co. was the difference in emphasis. At Goodrich the objective was to make a superior synthetic rubber — loss of properties could not be tolerated; at General Tire & Rubber Co. our objective was a cheap low-grade stock which we were able to achieve and finally to improve beyond our expectations.

I respectfully request that you correct the erroneous opinions you have caused to be published in your report to the Senate Judiciary Committee.

I am sending a copy of this letter to the Editor of the RUBBER WORLD with a request that it be published.

E. S. PFAU

Technical Director,
Chemical Division,
General Tire & Rubber Co.,
Akron, O.

May 6, 1959

DEAR MR. SEAMAN:

I welcome the letters from Mr. Swart and Mr. Pfau, accounting "from the inside" for the development of oil-extended rubber. It was certainly not the intention of my monograph to detract any of the credit which is due to General Tire's research team, or to General Tire's management for this most significant development. Indeed my general argument in that section of the monograph was based on my own impression that, whatever its antecedents, it was General's research team and General's management that made the critical breakthrough.

Incidentally, for those who chance to read that section of the monograph, there are two technical corrections. Mercaptan is misspelled, and it should be made clear that the oil is added *after* copolymerization.

I should like to say a word with reference to Mr. John F. King's intelligent review of my monograph, which might eliminate certain misconceptions. This monograph was not written with the special concerns and problems of the rubber industry in mind, and it is likely to be misread by those who approach it seeking to find answers to those problems or concerns. It was, for example, in no way intended to enter into patent disputes, and I disclaim for it any authority with respect to such disputes. Thus, contrary to Mr. King's impression, I take no stand whatsoever on the legal strength of the government's case against Goodrich. My point was rather that the grounds on which the Department of Justice is arguing are such that win or lose, no vindication would be made thereby of the government-sponsored research program.

Further this monograph does *not* represent an official position. It is the 18th of a number of studies published by the Senate Subcommittee, each of which explores some aspect of the relationship between government and technology, each expressing the individual position of its author, and, hence, the position of one is sometimes in sharp conflict with the position of others.

Finally, I am not aware that I have been critical of any rubber company, or of the rubber industry, unless it is critical to suggest that firms are in business to make profits. I was indeed critical of particular public policies and methods of organization, but these I have not attributed to the wrong intent of individuals. Rather, I would consider them the mistakes of inexperience, for the problems of government in the large-scale organization and support of technological developments of this kind are something new. My monograph represents not the attempt to condemn, but to learn from that experience. I hope that those who read it (and it can be purchased from the Government Printing Office for 35 cents) will bear that in mind.

ROBERT SOLO

City College of New York,
New York, N. Y.

WASHINGTON REPORT

By JOHN F. KING

Future of Business, Labor Bills in 86th Congress?

As the 86th Congress passes the halfway mark and heads into the home stretch of its first session, legislative issues of keen interest to the rubber industry still hang unresolved in midair. But a pattern of action on these issues has begun to emerge so that it is possible to assess the prospects for enactment of some of the measures.

Anti-Trust Legislation Situation

In the field of anti-trust legislation—which because of the heavily Democratic complexion of the current Congress has more than a usual amount of interest for the rubber industry and business as a whole—this is the picture:

The Senate Judiciary Committee continues to be the key to any new anti-trust legislation. As RUBBER WORLD went to press, the Committee, headed by Sen. James O. Eastland (Dem., Miss.), was mulling over three important bills which had the approval of its Anti-Monopoly Subcommittee, headed by Sen. Estes Kefauver (Dem., Tenn.). All three measures have aroused strong business opposition, but there is at the same time vocal support for them from within the business community.

The best-known is that hardy perennial of proposed business regulation, S-11, or the "Good Faith" bill. Strongly opposed by The Rubber Manufacturers Association, Inc., this measure would deny a manufacturer charged with price discrimination to defend himself with the argument that he cut prices "in good faith" to meet competition and not as a predatory move to eliminate competition. There is some doubt that this bill will ever clear Eastland's Committee and get to the Senate floor for a vote. Even in this eventuality, there is serious doubt that the bill would ever pass the House.

Secondly, and a more lively prospect for eventual enactment, is the so-called premerger notification bill. This measure would require companies with combined assets of more than $10 million to give the government 60 days' notice of their intended merger. Because of mounting business opposition, there has been some question that the bill will clear the Judiciary Committee and Senate debate this year, but the experts think it can. In the House, Chairman Emmanuel Celler (Dem., N. Y.) of the House Judiciary Committee plans June hearings on the merger bill, with the signs pointing to House passage if the powerful Rules Committee can be persuaded to go along.

The third item in the Judiciary Committee's hopper is the so-called "Civil Investigative Demand Bill." It would give the Justice Department the right to subpoena documents in civil anti-trust suits, something which it is now barred from doing.

Business generally is not open in its opposition to this legislation, but Committee members privately have learned of its controversial nature. Because of the quiet campaign against the measure, which is backed by the Administration, it may be sidetracked for the first session. It also may be that opponents of S-11 in the Senate would agree to its enactment in exchange for an agreement permanently mothballing the "Good Faith" measure.

The one measure in the anti-trust field that looks like a sure bet for enactment this session is the bill providing for the "finalization" of Federal Trade Commission decrees. Already approved by the Senate and headed for hearings by the Celler Committee in the House shortly, this measure would make FTC price discrimination rulings and consent decrees of the federal courts immediately enforceable. Under current procedure, violation of consent agreements cannot be prosecuted unless it can be proved to be the third consecutive violation.

Finally in the field of business-regulation legislation, the Senate Small Business Subcommittee of Sen. Hubert H. Humphrey (Dem., Minn.) has scheduled its long-awaited public hearings on dual distribution by manufacturer and independent retail outlets in the tire industry. The Humphrey Subcommittee has set aside three days in mid-June for the open sessions. At the same time, Rep. James Roosevelt (Dem., Calif.) of the House Small Business Subcommittee on Retailing might hold hearings on the same subject at about the same time.

Taxation Bills

In the field of taxation legislation, there are three noteworthy developments.

First, House Ways & Means Committee Chairman Wilbur D. Mills (Dem., Ark.) announced he would start in November to chart a "constructive reform" of the federal tax structure, looking toward cuts in individual and corporate income taxes, perhaps by 1960.

Second, the resolve of the Democratic leadership in Congress to reject President Eisenhower's request for a 1.5¢ hike in gasoline taxes has hardened to the point where the gas-tax boost is all but dead this year.

Third, the Administration gave its endorsement, quite reluctantly where the Treasury was concerned, to a measure to lighten the tax load on foreign-source income of American companies.

Despite the mounting deficits in the Highway Trust Fund, it appears that the Democratic leaders in the Senate and House have decided to push a waiver of the Byrd Amendment to the 1956 Highway Act, which requires construction of the interstate road network to proceed on a "pay-as-we-go" basis. The RMA and the transportation industry generally are vigorously opposed to Mr. Eisenhower's proposal for a boost from 3¢ to 4.5¢ in the federal tax on gasoline. The rubber group has endorsed the stand of the National Highway Users Conference for a two-year moratorium on the Byrd amendment o keep the construction program on schedule, even if it means deficit financing.

On the foreign side of the tax picture, Treasury Secretary Robert B. Anderson wrote the House Ways & Means Committee in May that the Administration will support legislation authorizing deferral of U. S. taxes on overseas income of special "Foreign Business Corporations" until such income is repatriated for distribution at

home. The Foreign Business Corporations, or "FBC's" in Treasury's terminology, would be a class of corporation specially created to handle the overseas business of American companies. They could be set up by reorganizing current corporate structures to get the benefit of tax deferral. The idea of FBC's and the deferral privilege is to spur foreign investment by American firms, particularly in the less-developed countries of the world.

Secretary Anderson did not specify, but he said the deferral privilege should be restricted to American businesses operating in the underdeveloped areas of Latin America, the Middle and Far East, and Africa. A related measure he said the Administration would go along with in the interests of increasing the outflow of U. S. private capital to less-developed nations would be to permit U. S. companies to treat as "ordinary loss" instead of capital loss any losses suffered for political reasons, such as expropriation or war damage.

The Treasury chief also indicated the Administration would get busy with negotiating tax treaties with underdeveloped countries featuring the so-called "sparing" provision. This would permit a U. S. company in such countries to claim a U. S. tax credit for foreign taxes which were "spared" or not collected.

Labor Legislation

In the field of labor legislation, the Kennedy labor reform bill has passed the Senate, but appears hopelessly mired in political maneuvering in the House. From all appearances, the Administration is not satisfied that the Kennedy bill is "tough" enough on organized labor, and a repeat of last year's performance — where the Kennedy reform bill passed the Senate with only one dissenting vote, yet died in the House—may be in the offing.

Another bill by Sen. John F. Kennedy (Dem., Mass.) to raise the federal minimum wage from $1.00 to $1.25 an hour and extend the law's coverage to another 7.2 million workers is being studied by the labor committees of both Houses. This measure is strenuously opposed by dealers in many different types of rubber end-products, but is of little concern to the rubber manufacturing industry.

Eventual Reduction of NR Stockpile Depends on Resolving Legal Tangle

As it had to eventually, Congress finally began moving toward a gradual reduction in the vast expense of maintaining the national stockpile of strategic industrial materials. One of the first items in the stockpile ordered to be cut back is the estimated 1¼ million long tons of natural rubber.

The Legal Tangle

Unless the Administration produces some pretty tight legal arguments showing why this cannot be done without special legislation—or unless the Senate can overrule the House—the General Services Administration some time this fall will set about disposing of the first quantities of stored rubber.

GSA received its orders to begin the disposal effort in the clearest terms possible. The House voted to cut out of the fiscal 1960 budget $49.4 million GSA had requested to replace perishable goods that will be rotated out of stock during the year beginning July 1.

The bulk of the appropriation item would have gone to buy up new natural rubber to replace the deteriorating stocks that had to be sold. Part of the money at the same time would have been used to replace essential fibers and special industrial oils which are rotated to prevent deterioration. It is estimated that 30,000 to 40,000 tons of rubber are rotated annually.

The House action, if upheld by the Senate as expected when the upper chamber passes on fiscal 1960 Independent Offices appropriations, presents GSA and the Office of Civil & Defense Mobilization (OCDM) with a ticklish situation. The basic 1946 Stockpile Act forbids the disposal of any stockpile item without specific approval by Congress. Yet, to prevent deterioration, perishable items must be sold for commercial use.

The only way out of the legal bind that GSA sees is to determine that perishable items now deteriorating in stock—bearing in mind there is no money to replace them under normal rotation—are "obsolete" in terms of the 1946 Stockpile Act. That statute permits a sell-off of "obsolete" items without specific Congressional authorization. Even acting upon this interpretation of the Act, however, GSA would have to wait six months after announcing its intention to sell off the "obsolete" rubber to get the advice of the industry on how to go about it without disrupting the commercial market.

Stockpile Reduction Problems

That any liquidation of the rubber stockpile is necessarily a long-term proposition is evidenced by the market reaction to the House action. Rubber prices, which just the day before were up sharply because of heavy Red Chinese purchases, tumbled badly, but recovered when the market realized that only a small amount of sell-off could be involved, and that it would take some time to carry it through.

Yet the House action indicates that Congress is serious about paring down the huge surpluses of industrial raw materials now on the government's hands. During the Appropriation Committee's hearings on the GSA 1960 budget, Congressmen elicited from stockpile managers that about $4 billion worth of goods in the stockpile—nearly half—is "in excess" of national emergency needs.

The Committee acted accordingly. Besides refusing GSA new rotation purchase funds, it ordered the agency to finance its storage and operating costs from the income it would realize from the sale of the perishable stockpile items.

The Committee then cancelled all remaining unspent appropriations—an estimated $107 million—so that the stockpile program would start fiscal 1961 with no funds on hand. At that time the Committee will undertake a full review of the whole stockpile program.

This would set the stage for a major effort in Congress to cut down on the size of the national defense stockpile. Such a development would be ironic in that the Administration itself has sought ways of cutting it back. Despite the many studies of how to do it without wrecking markets, however, the executive branch has never formally proposed any plans for liquidation.

NSF Budget Cut Also

In the Independent Offices Appropriation, the House also reduced the National Science Foundation fiscal 1960 budget from the requested $160 million to $143 million, which is still $9 million more than NSF received in fiscal 1959, and more than 50% more than the agency received in fiscal 1958. It was the Appropriation Committee's view that "this is a very large increase in the program of this agency in so short a space of time."

Investment in Malaya Has New Guarantee

The Federation of Malaya and the United States have signed an agreement that will permit the guaranteeing of new private investment by American nationals in Malaya against loss by expropriation or inconvertibility of Malayan currency. The agreement, which became effective April 30, is designed to encourage private American investment in the Federation.

As the U. S. Investment Guaranty Program operates, the private individual or firm purchases "insurance" from the United States Government against

losses occurring through currency inconvertibility, expropriation, or war damage. The U. S. will offer the insurance against such risks in any of the three-dozen countries with which it has investment guarantee agreements.

Under the program, only new investments can qualify for the insurance, and the host government must approve the investment beforehand. Thus, U. S. rubber company investments now in the Federation would not be eligible for coverage, but expansions of old investments or the undertaking of new ones would be eligible.

So far, the U. S. Government has insured more than half a billion dollars worth of private American investments abroad. The administration currently is seeking Congressional approval of an increase in the insurable maximum to $1 billion. The program has been in operation since 1949, but until 1954 was relatively inactive.

The Federation Embassy said the advantage of its agreement with the U. S. on the guarantee program is that it removes "doubt and fear from the minds of potential American investors that they might lose their investment (in Malaya) as a result of political circumstances which cannot be foreseen and are beyond their control."

FTC-Firestone Tire Dealer Price Order

The Federal Trade Commission has ordered Firestone Tire & Rubber Co. to stop giving illegal price concessions on tires and tubes to a favored few of its 12,000 to 14,000 direct franchised dealers. FTC late in May adopted the March 26 initial decision of Examiner Joseph Callaway, which was based on a stipulation between counsel in lieu of evidence. The Examiner held that Firestone has classified about 50 of its direct franchised dealers as "warehouse dealers," giving them price benefits not accorded to their competitors.

These price discriminations, according to FTC, "may result in a substantial lessening of competition between the favored and unfavored dealers" in violation of the Robinson-Patman Act. It ordered Firestone to charge the same net price to purchasers who compete with each other in reselling or distributing its products.

In its ruling the Commission also upheld Callaway's dismissal of the complaint that Firestone pays some of the favored customers a 5% warehouse commission on purchases of home and auto supplies in addition to tires and tubes. The examiner found this practice was terminated by Firestone over a year before the original complaint of the FTC was issued in May of 1958.

IRSG Estimates Rubber Supply/Demand Position

The Management Committee of the International Rubber Study Group held a meeting in London, England, May 11, 12, and 13, following which it issued a communique in which it stated that it had examined the statistical position of rubber and made estimates for requirements and supply of rubber as a whole (natural and synthetic together) during 1959.

It was estimated that the world might consume some 3,520,000 long tons of natural and synthetic rubber, apart from synthetic rubber produced in non-member countries; this estimate is on the assumption, which may or may not be fulfilled, that non-member countries, notably the USSR, will continue to purchase natural rubber at the relatively high rate at which they bought in recent months.

It was estimated further that the world supply of natural rubber would be at least 1,970,000 tons and possibly materially higher; while the annual production capacity of synthetic rubber in member countries is of the order of 2,040,000 long tons. In view of uncertainties, notably as to the requirements of non-member countries and of the effect of recent price movements, it was not considered possible to forecast at this stage the relative shares of total consumption which will be met by natural rubber and synthetic rubber, the communique concluded.

INDUSTRY NEWS

U.S. Rubber, Seiberling, General Sign with URCLPWA

Plants of the Firestone Tire & Rubber Co. and The B. F. Goodrich Co. were still struck by the United Rubber, Cork, Linoleum & Plastic Workers of America, AFL-CIO, as RUBBER WORLD went to press in late May, with no indication of when the deadlock would end over company-wide contracts, pensions, insurance agreements, and the supplemental unemployment benefit (SUB) plans. Some 18,000 workers are involved at Firestone plants, and about 14,000 at Goodrich plants throughout the country.

U. S. Rubber Settlement

United States Rubber Co., where about 24,000 workers went on strike on April 9, reached a settlement with the URCLPWA on May 1. This agreement will run to June 1, 1961, and contains the usual 60-day wage reopening provision. The maximum SUB has been increased from $25 to $30 per week, and benefits are extended from 26 to 39 weeks in those states having established unemployment compensaion plans in excess of 26 weeks. Where an employe is eligible for SUB payments and state unemployment compensation is not available to him, the maximum SUB payment is increased from $48.30 to $52 per week. The company's contribution remains at 3¢ per hour per employe. Goodyear made these same adjustments.

The pension and insurance agreement will run until July 1, 1964, without a reopener. Administrative changes were made in surgical, hospitalization, and in-hospital medical plans, but benefits were not modified. The past formula for normal retirement was retained. Eligibility for normal retirement has been reduced to 10 years at age 65. Minimum pensions will be based on $2.10 per month per years of service, as compared with the former minimum of $1.80. The union has agreed that it will not request further adjustment in pensioners' payments in the future.

Disability pensions, formerly $80 per month, have been increased to $100 per month, with full Social Security deduction. At age 65, disability pensions are recomputed on the normal pension formula.

Other Settlements

Seiberling Rubber Co. and the

URCLPWA signed a new master contract, welfare and SUB programs on May 20. The master contract and SUB programs run until May 1, 1961; the pension and insurance agreement until May 1, 1964. Modifications in the SUB plan were similar to those made with Goodyear and U. S. Rubber. The pension plan incorporates the same basic plan as provided in the Goodyear settlement.

General Tire & Rubber Co. and the URCLPWA reached an agreement on a new labor contract and fringe benefit plans, including pensions, on May 18. The old contract had expired on May 1, but the union had continued to work on a day-to-day basis during negotiations. The General Tire agreement includes improvements in fringe benefits, generally similar to those reached earlier between the union and Goodyear Tire & Rubber Co. and United States Rubber Co.

Firestone, Goodrich Strike

The strikes at the Firestone and Goodrich plants seemed no nearer solution in late May, despite about six weeks of negotiations. At least the union took this position in reporting to its members at a meeting of the Akron Firestone local in that city on May 19. One of the major difficulties seemed to be in connection with the retirement pension details. The Akron Goodrich local met with its members to explain the progress of negotiations on May 24.

In a letter to its striking employes, Firestone in May repeated that it could not "go beyond what our largest competitor, Goodyear, has done," in settling the strike. Firestone said it had offered the union a plan which would provide an average company pension of $65.84 a month, compared with the present $50.84, over and above full Social Security.

The union, in a bulletin to officers and representatives of Firestone locals, listed 13 items it said would bring Firestone up to standards which it claims workers at other major rubber companies enjoy.

Meanwhile opinions of some of the strikers and their wives began to appear in the *Akron Beacon Journal* in late May critical of the continuation of the strikes and of the union leaders for not arriving at a settlement in view of those made with U. S. Rubber, Seiberling, and General Tire.

Record Year Despite Strikes, Predicted; Prompt Stockpile Reduction Again Urged

H. E. Humphreys, Jr., chairman of United States Rubber Co., in a talk before the annual meeting of the National Industrial Conference Board in New York, N. Y., May 21, reaffirmed an earlier prediction that the rubber industry will set a new record in 1959, in spite of the current labor strikes. Total sales by the rubber industry were estimated at $6¼ billion for 1959, with less than half of this total forecast for the second six months. A strong uptrend in rubber industry business in the final quarter of 1959 leading to a still higher level of business in 1960 was his estimate of the near-term future situation.

Although profit levels for the whole year are difficult to predict, it was Mr. Humphreys' guess that total rubber industry net income for 1959 should be between $280 and $300 million, well ahead of the $249 million made last year and somewhat above the previous record of $274 million in the year 1956.

Passenger-car tire replacement sales of 64.5 million units, 4.7% above the previous high of 61.6 million units in 1958, were estimated. Original equipment tire sales in 1959 are expected to amount to 29 million units, or 24% above the 23.4 million units shipped in 1958, it was said. This year will be a good one for non-tire products also, with a pickup in demand for industrial products now being experienced.

If wages should rise this year, higher prices for rubber products would be necessary, according to Mr. Humphreys. The volume of business in the first quarter was stimulated by heavy customer buying in anticipation of possible strikes. As a result, first-quarter profits were enhanced by this high volume of production, which resulted in lower unit costs. Under more normal conditions, current selling prices will not create profit margins in the industry so high as those reported for the first quarter, in the opinion of the U. S. Rubber chairman.

Capital expenditures by the rubber industry are expected to total about $165 million in 1959, as compared with the $134 million spent in 1958 and the previous peak of $201 million which occurred in 1956.

In connection with his comment on the record first-quarter consumption of 421,000 long tons of new rubber and the estimated record consumption for 1959 of 1,550,000 long tons for this year, Mr. Humphreys referred to the rapidly increasing demand for rubber throughout the world and the upward pressure on natural rubber prices during recent months. He added that meanwhile the United States Government sits on a very large stockpile of natural rubber that is no longer required to be kept at its present high level and does nothing to relieve this growing demand for more rubber. The Congress should take immediate steps to provide for proper and orderly disposal of a sizable portion of the surplus rubber during the period when demand pushes rubber prices up, he added. It is particularly important for the Congress to act promptly since the law requires a six-month waiting period after Congressional action before actual disposal can be started.

Worldwide Expansion Planned by Firestone

A 30-month, $55-million expansion program for its worldwide production facilities has been announced by the Firestone Tire & Rubber Co., Akron, O. Total investment in the United States will be more than $40-million; the balance, abroad.

Included in the expansion plans are two new plants, one in Alcochete, Portugal, which is now under construction and is scheduled to go into operation late this year. Preliminary work on the second plant, at Orange, Tex., has been completed. This plant, an addition to the Firestone Petrochemical Center, will produce the company's new synthetic rubbers, Coral (polyisoprene) and Diene (polybutadiene).

Expansion and modernization programs are under way or planned for the firm's tire plants in Akron; Pottstown, Pa.; Memphis, Tenn.; Des Moines, Iowa; Los Angeles, Calif.; and Hamilton, Ont., Canada.

A multi-million dollar expansion program including a new tire manufacturing plant to be located in western Canada is planned by The Firestone Tire & Rubber Co. of Canada, Ltd. This plant is in addition to a modernization and construction program at the company's present Hamilton installation. Though the final site has not yet been selected, it is expected that the new facility will go into production in late 1960. At present a 50-acre site in Calgary, Alta., is being considered for the site of the plant. Production plans will call for a full line of passenger, truck, bus, farm, and implement tires which will be made available to the owners of 1,500,000 motor vehicles in Manitoba, Saskatchewan, Alberta, and British Columbia.

Other U. S. facilities scheduled for expansion are the synthetic rubber plant at Lake Charles, La.; the plastics plant at Pottstown; and the plant at Magnolia, Ark., where defense and industrial products are manufactured.

Foreign tire plants in the expansion program include those at Sao Paulo, Brazil; Buenos Aires, Argentina; Valencia, Venezuela; and also in Bombay, India.

Nylon Tire Yarn Now Offered by Allied

A new nylon tire yarn developed by National Aniline Division, Allied Chemical Corp., is now in commercial production at a new plant located near Hopewell, Va. The new yarn presents a singular achievement since it is based upon caprolactum, a raw material which other yarn manufacturers in many parts of the world have been unable to adapt to the manufacture of automobile tires.

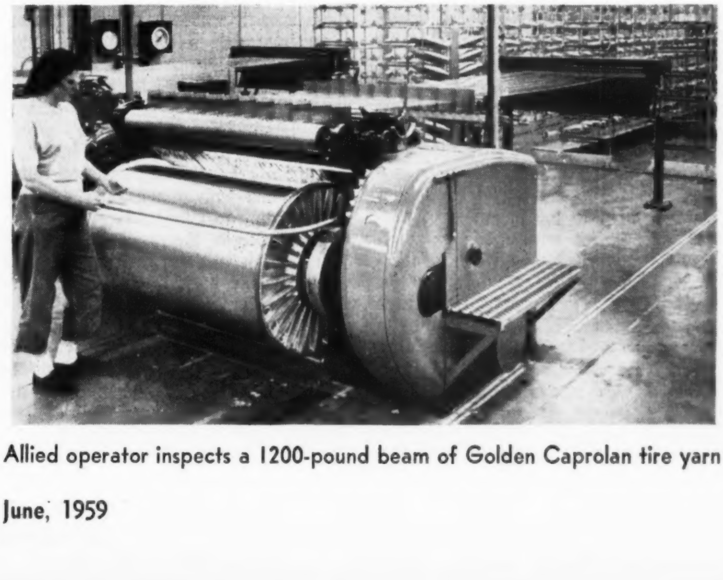
Used in volume by all major tire producers and a number of smaller companies, the new yarn is being made into casings for passenger cars, trucks, buses, and off-the-road equipment, according to G. H. Hotte, director of fiber sales and service for National Aniline. The yarn is naturally gold in color, rather than the conventional white of other nylon yarns, and has aptly been named Golden Caprolan. It is a polymer based on epsilon aminocaproic acid, with a molecular construction almost identical to that of Nylon 6,6.

The new yarn excels in terms of heat stability and possesses an exceptionally high level of resistance to flex fatigue, contributing importantly to the sidewall life of tires in which it is used. Its flex fatigue resistance minimizes blowouts because it is reported to maintain its exceptional high load impact over a longer service life. Also, it is said to have improved moisture resistance.

Allied Chemical has spent ten years of intensive research, development, and test-proving to produce successfully the first commercial caprolactum-based nylon yarn. Over the past several years major tire manufacturers have been subjecting the new yarn to rigid laboratory testing and road evaluations, including road tests in the Southwest, and numerous trials on trucks, buses, and taxicabs.

Caprolan was developed under the direction of Glenn A. Nesty, Allied Chemical vice president, who guided pioneer research teams toward the means of securing the purest caprolactum ever manufactured. He assigned a special task force to develop a method of imparting a high degree of heat stability to the yarn. The task force not only achieved this goal, but also established a new high standard of heat stability for nylon tire yarns, reports the company.

Pilot-plant quantities of Golden Caprolan were made available to principal tire manufacturers as early as 1954, but it was not until February of this year that Allied achieved full production in its modern nylon plant. The plant, with a rated capacity in excess of 20 million pounds, is operated by National Aniline Division in conjunction with a 60-million-pound caprolactum monomer plant and an extensive fiber application laboratory.



Allied operator inspects a 1200-pound beam of Golden Caprolan tire yarn

Goodyear's Giant Tire

The Goodyear Tire & Rubber Co., Akron, O., has produced a two-ton tire which stands 10 feet high, four feet wide, and sells for $14,000. Said to be the largest tire in the world, the tire is a research model for a planned line of earthmover and special-purpose tires for huge construction machines and other machines still in design stages.

When this tire is equipped with its rim, also built by Goodyear and also believed to be the world's largest in its field, total weight goes to three tons. The tire was built on a huge, electronically operated machine that covers 4,500 square feet of floor space. The tire building machine and the 60-ton mold used to vulcanize the record-breaking tire cost more than $250,000, according to Goodyear.

Goodyear's largest earthmover tire

Size designation of the tire is 44.5-45. Vehicles equipped with these 44.5-45 tires at 32-ply rating will be able to carry more than 30 tons at 30 miles per hour with 35 pounds of air pressure. Load capacity for the same tire with a 50-ply rating will increase payload to more than 40 tons at better than 50 miles per hour. This is more than twice the carrying capacity of 33.5-33 tires, the largest earthmover tires now in general use.

Earthmoving vehicles, rubber-tired bulldozers, and huge scrapers used to build major construction projects need large tires with low-pressure and high flotation to prevent bogging in soft earth.

Retreads up for 1959

The time is not far off when the sale of retreads will equal that of new tires in the replacement field, stated J. W. Hodgson, manager, treading and repair material sales department, The Firestone Tire & Rubber Co., Akron, O. Speaking to the Central States Retreaders Association meeting in Louisville, Ky., May 10-12, Hodgson recalled the time when retreading was practically nothing.

Today, he said, it represents a potential volume of approximately $450 million. He predicted that 1959 would be a record year in the sales of both retread and new tires.

It is estimated that in 1959 the industry will retread 28,625,000 passenger tires, which means that for every two new tires sold in the replacement field, there will be one retread sold. On truck tire retreads, there will be 7,700,000 sold in the industry, which means that for every 10 new truck tires sold there will be nine retreads sold. Hodgson then predicted that the time is not far off when the industry will be retreading as many tires as there are new tires sold in the replacement field.

Rumianca Now in U.S.A.

Rumianca S.p.A. one of Italy's largest chemical firms, is now represented in the United States and Canada by Rumianca (U.S.A.) Chemical Corp., 375 Park Ave., New York, N. Y. Rumianca S.p.A., Turin, Italy, has been a chemical producer for more than 40 years. Its principal products are heavy chemicals, industrial chemicals, and fertilizers.

Recently the Italian firm negotiated licensing agreements or other arrangements with Stauffer Chemical Co., Amchem Products, Inc., Olin Mathieson Corp., and United States Rubber Co. In 1958, Rumianca joined with U. S. Rubber to form Naugatuck-Rumianca, S.p.A., to manufacture and sell a complete range of chemicals for the rubber industry which is operating in Italy.

In addition to Alfonso Liguori, who is executive vice president of Rumianca (U.S.A.) Chemical Corp., the president is Renato Gualino, who is a member of the parent firm's board as well as of Naugatuck-Rumianca's board.

Du Pont Plans New Lab for Elastomer Research

A $6-million research laboratory for E. I. du Pont de Nemours & Co.'s elastomer chemicals department will be built at its experimental station in Wilmington, Del. The new laboratory will be devoted to fundamental and long-range research in the field of elastomeric materials.

The new laboratory will consolidate research activities of the department which have been conducted at two separate locations in the Wilmington area: a laboratory jointly occupied with the organic chemicals department at the experimental station and the Jackson laboratory at Deepwater Point, N. J.

The new building will contain 40 fully equipped research laboratories, most of them to provide facilities for two research men working together, and six analytical laboratories. Other facilities will include processing and testing areas, offices for patent services and for supervisory personnel, conference rooms, and a lunch room.

A number of products stemming from Du Pont's elastomer research will be incorporated in the new structure. The roof will be covered with neoprene coated with Hypalon synthetic rubber; urethane foams will be used in furniture and wallboards; floor tiles will be made of Hypalon; and the driveway will be surfaced with neoprene and asphalt.

The research effort of the new laboratory will be both fundamental and applied and will be directed toward new technology and new products.

Safety Cell Fuel Tank

The first crash-resistant fuel tanks are now being produced for military use by The Goodyear Tire & Rubber Co., Akron, O. The new tank, called the Safety Cell, has undergone exhaustive testing, in cooperation with the Federal Aviation Agency, and has successfully withstood impacts exceeding 30 G's—the maximum level of human tolerance.

This means that the danger of vaporized combustion at impact is substantially reduced, thus increasing the chance of survival in a crash.

The aviation products division of Goodyear is producing the new Safety Cell for the Army YHC-1A helicopter and the Army H-21 helicopter. Goodyear has been working in cooperation with the FAA's Technical Development Center at Indianapolis, Ind., since 1949 to develop the new fuel tank.

In the most recent tests, an aircraft fuel cell in a wing section simulating transport aircraft was slammed into a solid sandbag barrier at a speed approaching 100 miles per hour. The result was a 30-G impact, but the new tank, constructed of rubberized nylon, did not burst or shower its fuel. In contrast, a lightweight conventional tank was smashed into the barrier at a speed which would rupture it. It shattered into many pieces.

General Tire Has One-Shot Foam Process

The General Tire & Rubber Co., Akron, O., has perfected a one-shot method of producing polyester-based urethane foam which is claimed to reduce substantially manufacturing time and simultaneously boost product quality. The new method, which is controlled by an issued patent, United States patent No. 2,866,744, under which General Tire has exclusive rights, is expected to be a major factor in the tremendous upsurge in ether-type urethane usage in the next five years.

The one-shot manufacturing method is said to eliminate a number of intermediate production steps and to make possible the addition of all components right at the mixing head which produces the foam. An object of the invention stated in the patent is to provide vulcanizable elastomeric polymerization products of polyglycols and organic diisocyanates having superior physical properties, particularly high abrasion resistance, good flexibility at low temperatures, and good modulus, tensile strength, and elongation characteristics. Greater uniformity in cell structure creates 10 to 15% greater resilience, General Tire reports. A higher load bearing foam can be made, and there is an improvement in humidity aging.

General Tire predicted that at least 200 million pounds, or four times the present volume, of flexible polyether foam will be sold annually by 1964 along with an additional 100 million pounds of rigid polyester. General is currently producing polyether foam under the trade name, Polyfoam.

Resin Research Labs Reaches Milestone

Resin Research Laboratories, Inc., Newark, N. J., celebrated its fifth anniversary in May. Founded in 1954, the laboratory specializes in serving the rubber industry as an added research facility. Resin research offers experienced personnel and fully equipped laboratories.

Examples of the outstanding achievements of Resin Research in the elastomeric field over the past five years can be outlined as follows:

(1) Modifications of SBR and natural rubber latices with synthetic resins were developed for use in the manufacture of foam rubber for cushions, etc. This newly developed material is utilized for less expensive furniture manufacture where the current price of foam would be a difficult factor with which to contend. The success of the project was due to resin modification according to the work of J. Le Bras, of the French Rubber Institute of Paris, France. The resins were specially synthesized for this work. As a result, economics were encountered with no interference or modification in the overall foaming process.

(2) Another problem for which Resin Research found a solution was an elastomeric coating for leather gas-meter bellows to replace the oils used previously. Formulations were made that allowed gas-resistance while maintaining flexibilty and impermeability at ambient temperatures regardless of geographic locations.

(3) In another instance hammer faces were formulated of newer elastomeric materials to give a wide range of impact resistance and flexibility at different temperatures for military use.

(4) An elastomeric material was formulated for dental work which would make impressions, but be odorless, non-toxic, pleasant to taste, quick setting, and with dimensional stability.

According to Charles P. West, president of Resin Research, the rubber industry has not yet realized its great potential, and basic research must lead the way. Many smaller and middle-size companies should review their own potentials and take a larger interest in research and development to their own great advantage, since the future of the smaller and middle-size company lies in specialization, he added.

Polyolefin Rubber on Stream in Italy

TABLE 1

Properties (raw copolymer):	C 23	NR	SBR
Thermal conductivity (cal./cm. sec. °C.)	8.5×10^{-4}	4.5×10^{-4}	5.3×10^{-4}
Thermal coefficient of linear expansion (increase in length/unit length °C.)	1.8×10^{-4}	1.7×10^{-4}	1.8×10^{-4}
Dielectric strength (volts/mil)	700	500	600
Mechanical properties (vulcanizates—reinforced with 50 phr. HAF):			
Tensile strength (ASTM D 412-51T), psi.	3,600-4,000	4,100-4,400	3,700-3,900
Elongation at break, %	450-500	550-600	400-450
Stress at 300% elongation, psi.	1,300-1,700	1,600-1,700	1,650-1,900
Tension set; test specimen stretched at 200% elongation, bar kept at said strain for one hour; measurement one minute after releasing, in %	7-9	6	9
Hardness, Shore A	60-65	65	67

Montecatini of Milan, Italy, is now in semi-commercial production of ethylene-propylene copolymer elastomers at its Ferrara plant. The copolymers, one of which is designated C 23, are derived through the use of special catalysts developed by Prof. Giulio Natta, of Milan Polytechnic Institute, for the stereospecific polymerization of alpha-olefins. Production of the new synthetic elastomers marks another major commercial result of Natta's work on directed catalysis; the first was isotactic polypropylene plastic.

The new synthetic C 23 rubber is a very high molecular weight copolymer produced by polymerization of ethylene and propylene, two of the cheapest starting materials presently available. Its low specific gravity (0.85-0.86 g/cm^3) is said to permit specialized applications and to lower the cost of finished articles by giving more product per unit weight of material.

The overall properties of C 23 are very near to those of natural rubber and in many areas surpass those of conventional synthetics, according to the company. C 23 is said to exhibit exceptional resistance to oxidation, aging, and heat. Wear properties are also outstanding. It has excellent resistance to sunlight, ozone, acids, and alkalis, but very poor resistance to flame, aromatic and chlorinated solvents, as is the case with natural rubber. C 23 has poor resistance to aliphatic solvents.

Rebound at 20° C. is 75% (Luepke pendulum). Its minimum rebound is reached at —35° C. Brittle point (measured on standard apparatus) is remarkably below that of natural rubber. The copolymer also possesses excellent electrical insulating and thermal characteristics (see Table 1).

Vulcanization formulations have been developed permitting processing of C 23 with conventional equipment and techniques. Montecatini reports that the material can be easily mixed with normal fillers and can be produced in various grades, depending on application requirements.

The mechanical properties of C 23 vulcanizates (see Table 1) lie in the intermediate range between those of natural rubber and SBR rubber.

Preliminary samples of C 23, as well as a road-tested truck tire, were exhibited during the recent National Plastics Exposition in Chicago, Ill.

Technical information bulletins on C 23 synthetic rubber will soon be available from Chemore Corp., New York, N. Y., which represents Montecatini in the United States and Canada.

Butyl Tires Marketing Begins in 18 States

After many years of promising reports throughout the industry the all-butyl tire finally came of age on May 12 with the introduction of the Atlas Bucron tire by Esso Standard Oil Co. in 18 eastern and southern states from Maine to Louisiana, and the District of Columbia. The long development program to work out the many problems was successful, and the only cloud needing clearing is the temporary limited availability of the new tires due to the prolonged strikes in some of the producing plants which are making these tires.

The butyl tire is claimed to be outstanding in its shock absorbing qualities and in its smoother riding, safer, and quieter riding qualities. The natural resistance of butyl rubber to ozone prevents the cracking and deterioration which shortens the life of the conventional tire. The company said that an Atlas Bucron tire will not dry out and crack, and that even an unused spare will stay in perfect condition. Butyl rubber has already been approved by the Army for military truck tires since 1957.

Esso said that the combination of butyl and the special tread design produced one of the safest tires in existence. To emphasize the safety factor the company released the following data taken from a quarter of a billion miles of road tests:

	Stopping Distance—Feet	
Conditions	Ordinary Tire	Bucron Tire
Wet road (50 mph)	142	96
Dry road (50 mph)	105	71
Icy road (30 mph)	200	152

Butyl tires are claimed to be free from any squeal or screech when stopping or rounding corners. The tires have been proved by tests run in many parts of the world—the Arabian desert, South America, and on a frozen lake in Wisconsin. Fleets of test cars criss-crossed the country, and special tests were run at San Antonio, Tex., and in the high ozone concentration of Los Angeles, Calif.

The accompanying photograph shows the unique, two-groove tread used on the butyl tire.

The Atlas Bucron butyl tire showing two-groove tread

New Royalene Fibers Made by U. S. Rubber

United States Rubber Co.'s footwear and general products division, Providence, R. I., is now producing a line of polyethylene and polypropylene fibers, designated Royalene, which are said to have outstanding properties for applications ranging from nautical ropes to coaxial cable braid.

Six types of fibers are produced for groups of end-uses demanding special characteristics. In addition, the fibers are offered in round, flat, oval or ribbon shapes, in sizes ranging from six to 35 mils, and in several colors.

The six types of Royalene are: (1) a high-tenacity linear polyethylene having highest strength, heat, abrasion, and chemical resistance, designated as type A; (2) a fiber specially compounded for shrinkage, for heat and chemical resistance, providing unusual effects such as three-dimensional fabrics, designated as type C; (3) a fiber with very high shrinkage in boiling water, type E; (4) an electrical grade for applications requiring conformity to Bell Laboratories' specifications for insulation, type L; (5) a polypropylene for higher heat resistance and resistance to creep under sustained loading, type P (polypropylene also lends itself to multi-filament applications); (6) a high-density copolymer having superior resistance to creep under load, and retaining physical properties of the highest-grade linear polyethylene, type N.

Available colors include clear, white, bright yellow, international orange, cardinal red, maroon, deep blue, dark green, and black. Laboratory reports show no color change after 200 hours in a standard Fadeometer.

Among suggested end-uses for the fiber are nautical ropes, auto seat covers, filter cloths, decorative screening, shoe webbings, flat ropes, tow targets, handbag fabrics, upholstery, and outdoor furniture webbing.

Types C and E, compounded for shrinkage, are currently being used by the firm's textile division to make Trilok, the three-dimensional fabric used for decorative and special-purpose fabrics, like air filters.

New Process for Hose

A new continuous-production process developed by The Goodyear Tire & Rubber Co., Akron, O., is now being used to build large-diameter hose without splices in lengths limited only by the size of transportation facilities to handle it. Previously hose with an inside diameter more than 1½ inches had been limited to lengths of 100 feet.

New machinery and new production ideas were used to establish a non-stop production system to turn out hose with no splice weak spots. The hose is wrapped and sealed on a mandrel, wrapped with reinforcing cord, bagged, and cured in a continuous cycle.

Industrial hose users will realize savings with this new hose because couplings and sometimes troublesome splices are eliminated. The hose can be handled in reels, and there are savings in weight and handling costs.

Goodyear's first production with the new process was devoted to military projects. Four-inch hose was produced in 500-foot lengths to transport military fuels.

The firm's hose sales department expects immediate demand for the long-length, large-bore hose from the chemical and oil industries. Some of the first commercial uses are expected to be for off-shore unloading of tankers, off-shore drilling production, industrial waste disposal, and temporary pipe lines.

The new hose can be manufactured to float or sink for marine use and to handle all known chemicals and fuels. The hose is now available in sizes from two to eight inches inside diameter.

Rubber/Vinyl Flooring Sales Make Big Gains

Creative styling of rubber and solid vinyl flooring, stressing unlimited colors and a wide variety of new textures, is paying off in record sales increases, according to the Rubber & Vinyl Flooring Council, subsidiary of The Rubber Manufacturers Association, Inc., New York, N. Y.

Sales of solid vinyl in 1959 are expected to rise 30% over 1958 figures to 135 million square feet, and rubber flooring, 10% to 115 million square feet, it was announced at the "Fashions in Flooring" exhibit at the Plaza Hotel, New York, N. Y., May 5, sponsored by the Council. New flooring designs exhibited by the members ranged from simulations of marble, wood, and stone to gold and jeweled inlay effects.

The 250 million square feet of rubber and solid vinyl flooring projected for 1959 will have value of more than $75 million. Approximately 15% of sales will be in higher priced lines that are comparable in cost to the highest priced carpeting. This is evidence of a strong trend, particularly in the residential field, toward viewing rubber and solid vinyl, the aristocrats of resilient flooring, as decorative assets where design and color are more important than price.

Also, substantial additional impetus to long-range sales is expected to result from a new policy by which members of the Council will guarantee installations of rubber and vinyl on concrete in contact with the ground, without the use of high-cost special adhesives, if concrete slabs pass a simple new test for qualitative measurement. The test unit was demonstrated at the Plaza showing, and it will be distributed exclusively through the Council.

To Make Ion Engines

A new firm, named Goodrich-High Voltage Astronautics, Inc., has been formed to research, develop, and manufacture ion propulsion devices for propelling vehicles in space at speeds of more than 100,000 miles an hour. The new firm, headquartering in Burlington, Mass., is a joint enterprise of The B. F. Goodrich Co. and High Voltage Engineering Corp.

Development of a laboratory ion thrust unit is well under way, and work will proceed at HVEC's Burlington plant, it was announced. These ion thrust units or engines operate in a vacuum and, for that reason, will take over once a vehicle enters space. GHV Astronautics will work on the development of these engines and in the related area of power generation for the engines from nuclear and solar sources.

President of the new firm is A. John Gale, vice president and director of applied physics at HVEC. Chairman of the board of the new corporation is P. W. Perdiau, general manager of B. F. Goodrich Aviation Products Division. HVEC is reported to be an experienced designer and the largest manufacturer of Van de Graaf and linear ion accelerators. BFG's Aviation Products Division brings to the new firm its experience in space technology through the development and production of high-altitude full-pressure suits, solid propellants, rocket motor cases, and various missile components.

The essential elements of an ion engine are: (1) a prime energy source; (2) an energy converter; (3) ion emitter. By selection of the right ions and accelerating voltages, the ion drive principle offers a wide range of thrust/weight ratios and of specific impulses, both of which are critical engineering factors in the design of space vehicles. Either nuclear or solar power may be used for prime energy. Converters may be electrostatic generators or direct heat or light converters to electrical energy. Cesium and mercury are among the likely ion fuels. The chief advantage of the ion rocket for space propulsion lies in an extremely favorable fuel-to-payload ratio.

Other officers of the new firm are vice presidents, C. H. Stockman, BFG, and Henry C. Nields, HVEC; secretary, W. E. Scanlon, HVEC; assistant secretary, J. E. Carter, BFG; treasurer, W. D. Matthews, BFG; and assistant treasurer, John M. McCarthy, HVEC.

Nylon Cord Tires Top Rayon in Test

Second-line nylon cord tires outperformed more expensive first-line rayon cord tires by a wide margin in a recently concluded taxicab fleet test in Charleston, W. Va. This test was one of a continuing series conducted by E. I. du Pont de Nemours & Co, Inc., Wilmington, Del., throughout the country to compare actual road performance of various types of tires and to supplement laboratory evaluation of tires and tire cord. The less expensive second-line nylon cord tires used in the test are list priced at approximately 13% below the first-line original-equipment rayon cord tires.

Du Pont reports that the second-line nylon cord tires rolled up greater mileage than the first-line rayon cord tires. None of the rayon cord tires survived the fourth retread, but 44% of the nylon cord tires remained in service when the test period ended. The nylon cord tires had covered nearly 2,100,000 miles. By the time all the rayon cord tires had failed, they had accumulated a total of slightly more than 1,460,000 miles.

Impact failures accounted for the removal of 32 of the 40 first-line rayon cord tires which began the test. Only seven of the 39 second-line nylon cord tires failed because of this type of damage during the test. Ten of the 32 rayon tire cord failures occurred during the original tread and first recap period. In addition to the seven impact breaks with the nylon cord tires, there was one ply separation and one fatigue break.

On the basis of the superior performance of the second-line nylon cord tires compared to the costlier rayon cord tires, the taxicab company has expressed its intention to purchase nylon cord tires as replacements in the future.

BFG's Schoenfeld Is Recipient of IRI Award

As the winner of the Industrial Research Institute's 1959 medal, Frank K. Schoenfeld, vice president-research and development, The B. F. Goodrich Co., spoke at IRI's annual meeting in Buck Hill Falls, Pa., recently. He made a plea for American scientists to adopt a global social outlook."

More than 250 research executives, representing industrial research staffs totaling 145,000 persons, gathered to acclaim Dr. Schoenfeld for his outstanding accomplishment in leadership in or management of industrial research which contributes broadly to the development of industry or the public welfare. It was the first time that the IRI's annual medal of honors had been awarded to someone who is engaged in the rubber industry.

F. K. Schoenfeld *(left)* receives the Industrial Research Institute, Inc., 1959 medal from T. H. Vaugh, executive vice president, Pabst Brewing Co., and immediate past president of IRI

Dr. Schoenfeld advised, "We must bring to the world a leadership in understanding born of science, because the practical application of scientific knowledge in itself is not enough to alleviate the ills of men and bring about an orderly world. . . . Soviet progress has done what American scientists have failed to do: It has aroused our nation's interest in scientific achievement. We must take advantage of the surge of public awareness to overcome tendencies to stay aloof from political activities and to shun management responsibilities. . . .

"Now is the time to come out from behind the test tube," he said, "to make ourselves heard, to accept the leadership that must inevitably fall to science if we are to live tomorrow in a free world and a free space."

Elect New Committee

A completely new executive committee for the Scrap Rubber & Plastics Institute of the National Association of Waste Material Dealers, Inc., was recently announced by Ben Gordon, A. Schulman, Inc., Akron, O., newly elected president of the Institute.

The new executive committee members are: Henry Rose, H. Muehlstein & Co., Inc., Akron; Milton Kushkin, Schulman, East St. Louis, Ill.; Charles Rasher, McMahon Iron & Metal Co., Bronx, N. Y.; Joseph Viener, Hyman Viener & Sons, Washington, D. C.; and Hy Helbein, Southern Metals Co., Inc., Charlotte, N. C.

Serving with Gordon as Scrap Rubber & Plastics Institute officers are: Sidney Freedman, Muehlstein, New York, N. Y., vice president; and Harold C. Rowe, NAWMD, Inc., New York, secretary-treasurer.

Banbury Drying Urged For Synthetic Rubber

A process for using a Banbury mixer for dewatering synthetic rubber has been announced by The Patent & Licensing Corp., a subsidiary of The Flintkote Co., New York, N. Y. The process was invented by Paul Dasher, Dasher Rubber & Chemical Co., Fairport Harbor, O., and is available for licensing.

The process replaces the use of an oven dryer in the synthetic rubber manufacturing line and, according to the company, does the job quicker, more inexpensively, and more uniformly than current processes.

The dewatering is accomplished first by the pressure of the ram which forces some of the water out of the slurry and then by the heating action of the Banbury rotors on the rubber which raises the temperature to 250-300° F. The resulting steam escapes constantly and can also be further relieved by raising the ram for a brief period.

The process lends itself to the incorporation of oil, black, or other usual compounding ingredients at the same time as the drying step. The process is also said to provide rubber with a very uniform Mooney plasticity. Savings are estimated to run about $5 to $10 per ton in the manufacture of synthetic rubber. Using a #11 Banbury, the rate of output is estimated to be from 6,000 to 12,000 pounds per hour.

South Africa Site of Phillips Black Plant

A plant to manufacture oil furnace carbon black, used widely by the rubber industry in tires and other products, will be constructed in the Union of South Africa, according to a joint announcement made by K. S. Adams, chairman of Phillips Petroleum Co., Bartlesville, Okla., and H. J. van Eck, chairman of Industrial Development Corp. of South Africa, Ltd. The two companies are forming an equally owned company, which will be known as Phillips Carbon Black Co. (Proprietary), Ltd., to build and operate the plant.

The plant is expected to have an initial design capacity of 22 million pounds per year of oil blacks and is scheduled to be in operation within two years. Engineering and design work is under way, and location of the plant is being finalized.

The plant will use the basic Phillips Petroleum Co. oil furnace black process which was pioneered by Phillips. This process is used extensively by that company and its licensees both in the United States and in plants now operating and being planned in other countires.

Forms Firm for Industrial Products

The Dayton Rubber Co., Dayton, O., has formed a new company in Chicago, Ill., to handle its growing line of industrial and automotive products. The new division, designated The Dayton Industrial Products Co., will headquarter in a building under construction in the Melrose Park area west of Chicago, according to C. M. Christie, president of Dayton Rubber. All of Dayton Rubber's former mechanical goods sales division will be incorporated in the new company.

A number of executives, department heads, and key personnel will transfer to the new location. Robert G. Burson, a vice president of Dayton Rubber, will be in charge of the new company.

The Chicago operation will be responsible for sales, advertising, sales promotion, merchandising, product engineering and application for the growing line of Dayton Rubber automotive and industrial products. These include automotive V-belts, radiator and heater hose, industrial V-belts, hose and rollers, friction and plastic electrical tapes, graphic arts rollers, and lithographic blankets. Also included is the firm's new line of urethane products for a variety of industrial uses. There is also a full range of molded and extruded industrial rubber products.

The new company will maintain direct liaison with Dayton Rubber's manufacturing facilities at Dayton and Marietta, O.; Waynesville, N. C.; Three Rivers, Mich.; and the new plant under construction in Springfield, Mo.

Dill Mfg. Co. Reaches Fiftieth Year

Dill Mfg. Co., Cleveland, O., a leader in the tire valve industry, will celebrate its fiftieth anniversary on June 21. Arthur P. Williamson will mark 50 years of service at that time as president and treasurer to the company, of which he is one of the three founders.

Some of the products which Dill has manufactured during its history include spreaders (steel clampings which fitted around valve stems), Instant-On Dust and Valve Caps, a patented lock wheel for the Model T Ford, and standard construction of tire valves still used.

The company presently manufactures hundreds of models of valves and valve stems for the aircraft and automotive industries as well as hosts of tire accessories and tire repair equipment including the famous Dillectric vulcanization equipment.

Williamson carried the administrative burden of the company, while most of the early shop problems and product development were handled by Vice President Ed Tobold. Boyd S. Byall, now in his thirty-seventh year with the company, is manager of sales and secretary of the company.

Appropriate ceremonies and an open house will mark the anniversary not only at the Cleveland plant, but also at the Canadian facilities of Dill Mfg. Co., Ltd., at Toronto, Ont., Canada, and at the Dill sales offices and warehouses in major areas across the country.

"Excellently Managed" Firms Cited by AIM

The names of companies which it has certified to be "Excellently Managed" in their respective industry for the year 1958 have been announced by the American Institute of Management, Inc., New York, N. Y., a not-for-profit research and educational foundation devoted to the advancement of management.

Top companies selected in the rubber and rubber products industry were: The Eagle-Picher Co.; The Firestone Tire & Rubber Co.; The B. F. Goodrich Co.; The Goodyear Tire & Rubber Co.; H. K. Porter Co., Inc.; Raybestos-Manhattan, Inc.; and United States Rubber Co.

The citations, based on the Institute's continuing analysis of corporations in the United States, Canada, and Europe, are designed to bring deserved recognition to those companies whose managements are doing most to increase productivity, with accompanying benefits to employes, shareholders, their plant communities, and to the economy as a whole.

Audited according to the Institute's point system of appraisal in 10 key management functions, the above listed companies in the rubber and rubber products industry achieved more than the minimum 7,500 points for excellence out of a possible 10,000.

International Latex To Study Synthetics

A new million-dollar laboratory has been built in Dover, Del., by the chemical division of International Latex Corp., manufacturer of Tylac latex, and will be devoted exclusively to developing synthetic latices tailored for hundreds of different industrial applications. The goal of the laboratory is to hasten this development, bring to the surface new useful latex polymers for many industries.

Under the direction of Verle Miller, the new laboratory employs more than 50 researchers who will work in groups to attack problems of latex applications in carpets, paints, non-woven fabrics, paper, foam rubber, dipped goods, textiles, and adhesives. Each group will have an area to itself, equipped with special apparatus needed for research in its particular field. Members of each group have experience both in the consuming industry and in polymerization.

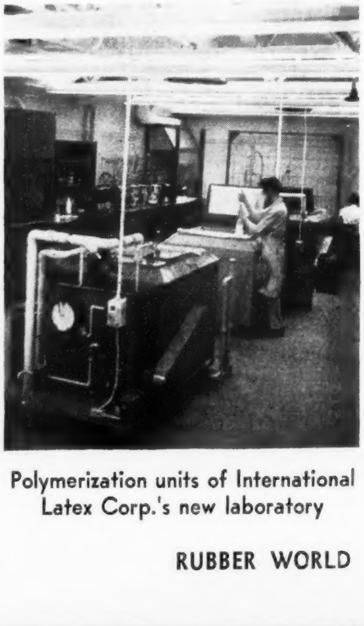
Three large bottle polymerizers, each able to handle 32 different polymerizations at a time, are available in the laboratory for making experimental samples. An electron microscope is used to determine latex particle size, which in latices has an important effect on the properties.

Adjacent to the polymerization laboratory are arranged a paint laboratory, an adhesives laboratory, a paper laboratory, a dipped goods laboratory, a textile laboratory, and a non-woven fabrics laboratory, each equipped for the full range of testing employed by its industry.

Also, there are two constant temperature and humidity testing rooms, one operated at standard conditions for testing rubber and textiles, the other for paper. An ozone chamber and various ovens are provided for aging testing, in addition to an aging block. Elsewhere there is a FadeOmeter, U. V exposure equipment, gas fading equipment, hardness testers, tensile strength testers, adhesion and mar testers, impact testers, scrub testers, stiffness testers, tear testers, burst tester, and abrasion testers.

The new facilities also include a pilot plant which has two five-gallon reactors with a 10-gallon stripper, and scale-up 100- and 200-gallon reactors with a 500-gallon stripper.

The opening of the new laboratory coincides with the completion of a threefold expansion of the Tylac plant. ILC's chemical division has concentrated in styrene-butadiene and acrylonitrile types of latices. In addition to handling customer problems, the company plans to work toward some long-range latex research goals of its own.



Polymerization units of International Latex Corp.'s new laboratory

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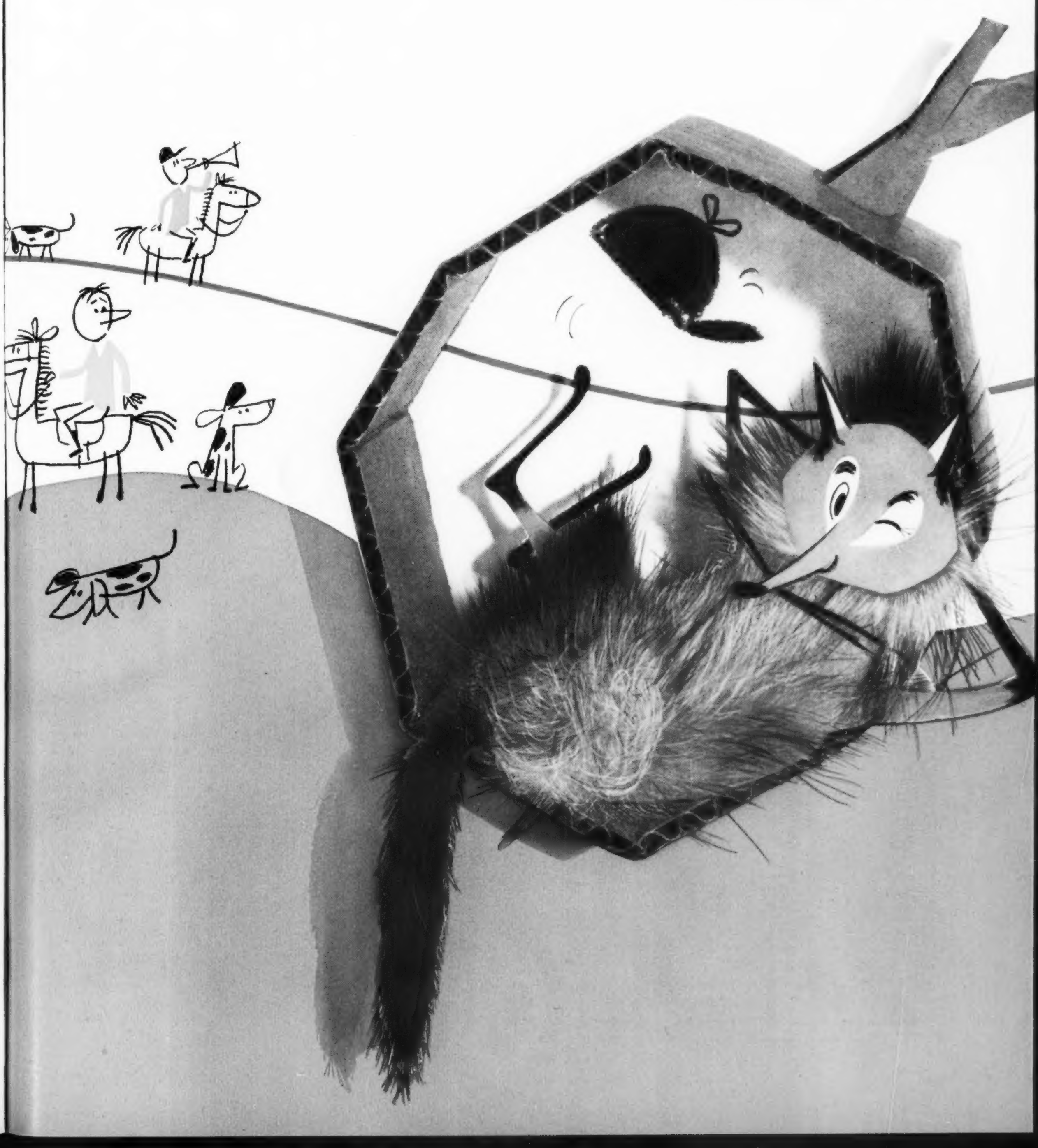

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HALLCO NEWS

Issued by
The C. P. Hall Co.
Chemical Manufacturers

No. 5

MODX CUTS COST OF HIGHLY COMPETITIVE RUBBER PRODUCTS

Modx, in tests conducted at the C. P. Hall Research Laboratories, acts as a vulcanization leveler in processing of off-grade natural rubber. Variability in the vulcanizing properties can be overcome by use of Modx in such low grade rubbers as Brown Crepes, Amber Crepes, Flat Bark Crepes and other natural rubbers of non-uniform quality. Smoked Sheets or combinations of them with other lower grade rubbers showed that modulus values were remarkably increased with use of 0.5 to 1.5 parts of Modx. Users of these natural rubbers in highly competitive lines such as mechanicals of all types, molded goods, extruded goods and plumbing specialties will enjoy lower costs and greater profits through use of Modx. As the table below shows, Smoked Sheets and Rolled Brown Sheets processed with Zinc Oxide, Stearic Acid, Phenex, and Sulphur alone, were compared with the same sheets to which only 1.0 part of Modx was added. At 287° F., tensile strength and 600% modulus were increased, while elongation was reduced.

		A	B	C	D
SMOKED SHEETS		100	100	......	......
ROLLED BROWN		......	......	100	100
Zinc Oxide		5	5	5	5
Stearic Acid		2	2	2	2
Phenex		0.75	0.75	0.75	0.75
Sulphur		3.0	3.0	3.0	3.0
MODX		......	1.0	......	1.0
	Cure 287° F.				
Tensile	10	2010	2425	1475	1920
	20	2735	3465	2150	2745
	30	3280	3870	2450	3185
	40	3600	4050	2830	3425
	60	3685	3480	3225	3275
Elongation	10	810	790	810	780
	20	760	750	740	740
	30	720	710	690	700
	40	700	700	680	690
	60	680	650	690	660
600% Modulus	10	570	855	485	745
	20	1100	1500	985	1325
	30	1630	2105	1515	1880
	40	2025	2340	1810	2130
	60	2220	2610	2050	2365

For further information and samples of Modx, call or write The C. P. Hall Company, Akron, Ohio.

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AKRON	CHICAGO	MEMPHIS	LOS ANGELES	NEWARK
Phone	Phone	Phone	Phone	Phone
JEfferson	POrtsmouth	JAckson	MAdison	MArket
5-5175	7-4600	6-8253	2-2022	2-2652

United Carbon Moves Its Main Offices

United Carbon Co., whose principal offices have been in Charleston, W. Va., since the formation of the firm 35 years ago, will soon begin the gradual transfer of its executive and departmental headquarters to other cities. The executive offices will be moved to Houston, Tex.; the marketing headquarters will shift to New York, N. Y.; and remaining departmental headquarters will go to Houston. The Appalachian area office of the company's gas and oil division, which has been considerably expanded in recent years, will be retained in Charleston.

The decision was dictated by various geographical circumstances affecting the company and its operations today, according to R. W. French, president. Specifically, over the years the manufacture of carbon black has shifted from the Appalachian area to the Mid-continent, the Gulf Coast, and the Southwest, to be close to necessary raw materials.

The company is interested in carbon black plants in Great Britain and Australia and other foreign nations. The company's oil and gas exploration and production have naturally gravitated to the newer oil and gas areas, including foreign countries such as Colombia, Guatemala, and Canada. Its international shipments of carbon black originates in the Gulf ports.

Relations with its customers and the business community are in the main conducted in cities other than its present headquarters. Acquisition of its Baytown, Tex., plant in 1955 moved the company's manufacturing operations center toward the Gulf Coast. The planned moves will be made gradually, giving every possible consideration to the employes affected.

Polymer Corp. Strike Brings Wives' Protest

In Canada, the strike continued at the Polymer Corp., Ltd., synthetic rubber plant. In mid-May it was reported that the Canadian director of the Oil, Chemical & Atomic Workers International Union had asked for a meeting with E. R. Rowzee, Polymer Corp. president, at the Ottawa office of Labor Minister Starr. Mr. Starr had sent telegrams to both the company and the union leaders urging a resumption of negotiations aimed at ending this strike which began in mid-March.

Meanwhile, in Sarnia, Ont., wives of Polymer Corp. strikers issued an ultimatum to the union leaders to the effect that unless definite steps were taken to end the strike soon, a full-scale war against the union's policy committee would be launched. No details of the plan of the strikers' wives were given. The group said they were not anti-union; they thought unions were good and necessary, but they were critical of the union leadership and asked what happened to all the funds the union collected in Polymer's 17-year history.

Picketing at the Polymer plant continued, including the use of a rowboat at the waterfront.

NEWS BRIEFS

GOODYEAR AIRCRAFT CORP., Akron, O., recently informed the Navy Department of the feasibility of the first nuclear-powered aircraft, a 4.5-million-cubic-foot non-rigid airship, approximately three times the size of blimps currently in use. The proposed nuclear-powered airship could be operational by 1963. Available for construction of the airship is a new rubberized fabric capable of withstanding radiation exposures up to one hundred million roentgens. Goodyear unveiled the plans for the airship just two days before it became known that the last official act of the late Deputy Secretary of Defense Donald A. Quarles was to urge President Eisenhower to give the go-ahead on an A-plane.

GOODRICH-GULF CHEMICALS, INC., Cleveland, O., has shipped almost ¾-million pounds of Ameripol synthetic rubber via the Port of Cleveland and the St. Lawrence Seaway to northern Europe. The rubber was produced at the firm's Institute, W. Va., plant and shipped to Cleveland by truck. There it was loaded aboard the freighter *Fredborg*, a ship belonging to the Swedish-Chicago Line. This first large export shipment of synthetic rubber via the Seaway will be processed into tires on the Continent.

DAYTON RUBBER CO., Dayton, O., has entered the industrial hose field, according to R. G. Burson, vice president of the firm's industrial products division. The new line will include air, water, steam, suction, and pressure hoses in a full range of sizes and construction. Jack O. Quamme has been named to the newly created post of product manager for the industrial hose line. Expanded production facilities and development of new construction techniques led to the decision to enter this field. Dayton Rubber has long been a major supplier of radiator and heater hose for the automotive industry.

NATIONAL POLYCHEMICALS, INC., Wilmington, Mass., has appointed The B. E. Dougherty Co., Los Angeles, Calif., its West Coast sales agent. Dougherty has long been one of the leading distributors of pigments, chemicals, compounding ingredients, and other materials and equipment to the West Coast rubber industry. It will now stock and sell National Polychemical's blowing agents and rubber compounding materials through its offices and warehouses in Los Angeles and San Francisco, Calif., and Portland, Oreg.

UNITED STATES RUBBER CO., New York, N. Y., has developed an underwater system for the economical storage of crude oil and fresh water at off-shore oil rigs. The proposed system utilizes large rubberized fabric tanks, each holding up to 50,000 gallons, anchored to the ocean floor. Connecting the tanks to an underwater manifold would provide a total capacity of 25,000 to 50,000 barrels at lower cost than present storage methods. Assisting U. S. Rubber in the development was Hanna Construction Co., Houston, Tex., a leading builder of off-shore oil rigs. U. S. Rubber plans to construct the tanks of a fabric and synthetic rubber combination that is not adversely affected by salt water and marine organisms, and that has been used in the past in the fabrication of flexible oil and gasoline tanks.

THE GOODYEAR TIRE & RUBBER CO., Akron, O., is manufacturing over-the-road truck tires of special construction for a new line of ground handling and launching equipment for the Atlas intercontinental ballistic missile. Only four 12.5-20 nylon truck tires with 18-ply ratings are required to handle the 74-foot, cradle-like trailers for overland transport of the 80-ton missiles. Six of the same-type tires in the 9.4-20, 14-ply rating size are used to haul boosters for Atlas IBCM's.

THE FIRESTONE TIRE & RUBBER CO., Akron, O., recently announced that at the conclusion of its June 1 broadcast of the 30-year-old Voice of Firestone radio-television program, winner of many awards, it would be withdrawn because no suitable network time is available. Presentations by the TV networks were recently heard by Firestone, but no suitable evening time period was offered. Firestone has announced no further plans about its participation in television programming. The Voice of Firestone was first heard by an American radio audience in December, 1928.

THE GOODYEAR TIRE & RUBBER CO.'s aviation products division, Akron, O., reports that it has developed and manufactures a new pillow tank with a rated capacity of 50,000 gallons, used for storing bulk liquid. The first tank of this size was manufactured under contract for the Army Corps of Engineers to be used for off-shore fuel storage. It is made of synthetic-rubber-coated nylon and is impervious to climate and the effects of contact with liquid petroleum products. The 50,000-gallon tank measures 64 feet in length, 24 feet in width, and weighs about one ton when collapsed. Goodyear is equipped to manufacture tanks for use both for commercial and military applications, with rate capacities of 100,000 gallons, and possibly more.

B. F. GOODRICH INDUSTRIAL PRODUCTS CO., Akron, O., reports the successful use of its conveyor belts with Hycar nitrile rubber covers for transporting copra, dried cocoanut meat, at the rate of 120 tons an hour. The Hycar rubber resists the softening, penetrating action of the cocoanut oil. The two 24-inch belts are installed at the copra terminal at Pier 84, operated by Cargill, Inc., San Francisco, Calif. One conveyor belt extends 260 feet center-to-center and discharges onto a 135-foot center-to-center belt which rises at a 13-degree incline carrying copra to the processing unit.

BIRDAIR STRUCTURES, INC., Buffalo, N. Y., is manufacturing a huge multi-dome enclosure for protecting missiles and their crews from dust, rain, and high winds during count-downs. The shelter, called the Pentadome, is nine stories high and entirely supported by air pressure. It is believed to be the largest air-supported structure ever built. The overall structure, minus blowers, doors, and anchors, weighs 19,500 pounds and uses 18,000 square yards of vinyl-coated nylon. The base fabric of the Pentadome is supplied by Wellington-Sears Co., New York, N. Y. The vinyl coating is done by Sawyer-Tower, Inc., Boston, Mass.

THIOKOL CHEMICAL CORP.'S Longhorn division, Marshall, Tex., has been awarded by Army Ordnance Ammunition Command, Joliet, Ill., a continuation contract in the amount of $11,900,165 for production of rocket motors and plant maintenance at the Longhorn Ordnance Works.

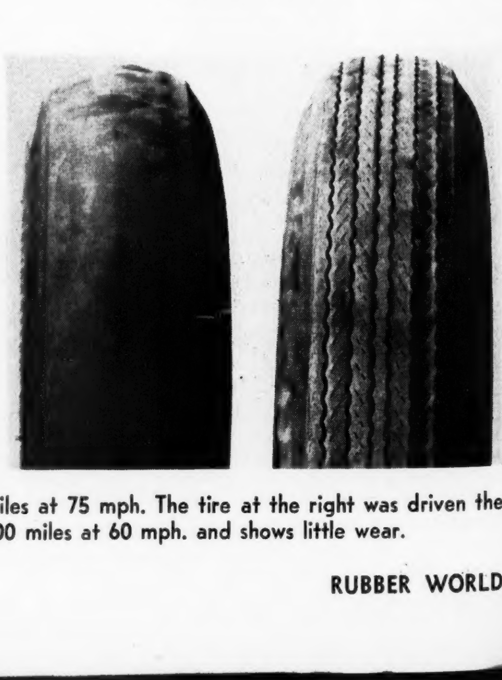
TECH ART PLASTICS CO., Morristown, N. J., the world's first molder of organic plastics, has been purchased by J. Harry DuBois, of Montclair, N. J. DuBois is proprietor of his own plastics consulting firm and is a director of National Beryllia Corp. He will become chairman of the board of Tech Art. Harold J. Cook will continue as president of the company. John P. Lombardi, formerly plant manager of Shaw Insulator Co., has been appointed vice president-manufacturing. Maximillian Morrof, an attorney, will become secretary and treasurer. Tech Art sales are handled by Insulating Fabricators Co., East Rutherford, N. J., and Insulating Fabricators Co. of New England, Watertown, Mass.

UNITED STATES RUBBER CO., New York, N. Y., has introduced a new line of Naugaweave for furniture upholstery, called Advance, with the breathability, soft look, and feel of fabric and the durability and cleanability of vinyl. Advance is made at the company's Stoughton, Wis., plant by a new manufacturing process that combines vinyl and fabric, with valley printing and embossing on a discontinuous pattern. Metallic filters are used for subtle highlighting. The printing of blended colors deep into the textured surface valleys gives a three-dimensional look to the upholstery. It is being introduced in ten colors—blue, mocha, gold, cardinal, spice brown, turquoise, grass green, charcoal, tangerine, and antique white.

EASTMAN CHEMICAL PRODUCTS, INC., has announced that capacity for the production of polyethylene at Texas Eastman Co. in Longview, Tex., is being increased from 85 million pounds to 100 million pounds annually. Eastman Chemical, a subsidiary of Eastman Kodak, markets the products of Tennessee Eastman Co. and Texas Eastman Co., divisions of Eastman Kodak. It was also announced that recent additions to the OXO facilities at Longview have brought the capacity for aldehydes to 125 million pounds annually.

LINDE CO., division of Union Carbide Corp., Tonawanda, N. Y., plans to expand plant capacity to insure adequate production of its molecular sieves, tiny synthetic crystalline zeolites that can remove offensive odors from natural gas, hasten the curing of rubber and plastics, and even make flying safer by removing the water that jet fuels attract. Linde has also announced that it has just been granted two United States patents covering the composition and manufacture of these zeolites. These molecular sieves are marketed as pellets or as a fine powder.

THE CARWIN CO., North Haven, Conn., has completed its second versatile manufacturing unit which doubles its capacity to produce the variety of monoisocyanates, diisocyanates, and **polyisocyanates** which it pioneered. Carwin announces commercial availability of ethyl isocyanate and phenyl isocyanate and plans for offering aliphatic diisocyanates and higher molecular weight aliphatic monoisocyanates in addition to its present tonnage products, n-butyl- and n-propylisocyanate, tolidine diisocyanate, dianisidine diisocyanate, and PAPI (polymethylene polyphenylisocyanate).



Effect of speed on tire wear illustrated. Each tire has been driven 19,200 miles, but at different speeds, according to B. F. Goodrich Canada, Ltd., Kitchener, Ont., Canada. The same make of car and equal road conditions were used in the tests. The worn tire *(left)* went 9,200 miles at 65 mph., then 5,000 miles at 70 mph, and 5,000 miles at 75 mph. The tire at the right was driven the entire 19,200 miles at 60 mph. and shows little wear.

UNITED STATES RUBBER CO., New York, N. Y., has introduced an improved line of repair materials for passenger and heavy service tires, designed to increase handling ease and shop efficiency. All retreading and repair gums and fabrics in the line are made from selected natural rubber, compounded to reinforce original tire construction. The complete line includes retreading gums, repair gums, repair fabrics, fabric tire repair units, tubeless tire repair materials, tube and valve repair materials, cements, coatings and solvent, shop supplies, flat base curing tubes, and section repair curing bags. A feature of the new line is a new, high-tenacity vulcanizing cement that is quick-drying and has improved flow and penetration.

THE MONOBELTING CORP., Oakland, Calif., is now offering a patented flange-edge conveyor belting which eliminates the use of troughing idlers. The design is said to reduce considerably initial conveyor cost and maintenance expense as well as to increase substantially belt life. This new one-piece belting is pretensioned to flex as it passes around the pulleys, eliminating fatigue due to flexing and allowing belt speeds much higher than those possible with troughed flat belts. It delivers from 40 to 200% more material than a conventional troughed belt of the same width traveling at the same speed. Available in widths up to 48 inches, this belting comes in every grade, type, and class of belting previously used in industry. Complete details are available from the company.

CANADIAN TITANIUM PIGMENTS, LTD., has moved its Montreal offices to 1401 McGill College Ave., Montreal 2, P.Q., Canada. The telephone number is VI 4-3381.

ALLIED CHEMICAL CORP., New York, N. Y., has acquired the Harmon Color operations of B. F. Goodrich Chemical Co., located at Haledon, N. J. Allied, through its National Aniline division and others, is equipped to supply nearly all of the raw materials and intermediates required for the organic color pigment business.

THE GOODYEAR TIRE & RUBBER CO., Akron, O., has established a special tuition-free foreign language training program to accommodate employes of Goodyear International and employes who are potential candidates for overseas assignments. Currently, 150 employes are studying any one of six languages: French, German, Indonesian, Italian, Portuguese, or Spanish. More effective international working relations are the object of the program.

INDUSTRIAL PRODUCTS CO., Philadelphia, Pa., safety equipment distributor, is offering a complete line of radiation protective clothing for use in nuclear systems work. This includes: medical and beret style hats, shirts, pants, lab coats, aprons, boots, plastic shoe covers, and translucent nimble finger Pylox gloves. Modestly priced, these garments are made of a non-woven fabric reinforced by high-strength nylon thread. Surfacing is cellulose wadding, specially treated for fire resistance and water repellency. The lab coat runs nine to ten ounces, and pants, 6½ to 7½ ounces, depending on size. The company also offers duck shoe covers with elastic tops and with protective plastic coating outside the soles. These lint-free covers can be laundered at high temperatures without shrinkage. Complete information can be obtained from the company.

Palmer-Shile Co., Detroit, Mich., is offering a stock trailer with a metal chart holder for record-keeping convenience and efficiency in stock selection. The trailers are designed to coordinate and speed up stock selection and movement in warehousing operations. Each unit is equipped with a wishbone coupler and an eye in the back, two swivel and two stationary rubber tired wheels, link chains and hook for towline operation.

DOW CORNING CORP., Midland, Mich., has completed licensing arrangements with Westinghouse Electric Corp. to produce and sell the world's purest silicon—material used in the manufacture of semi-conductor devices. This marks the first diversification from the manufacture of silicones in the 16-year history of Dow. Dow has secured patent rights and technological information on the Siemens-Westinghouse process which makes it possible to make ultra-pure silicon. Though Dow Corning has been making silicon as a first step in the manufacture of silicones, W. R. Collings, president of Dow, said impurities in the ultra-pure silicon must be less than one part in six billion.

DIAMOND ALKALI CO., Cleveland, O., will erect a new multimillion-dollar research center in Concord Township near Painsville, O. The award has been made to the Brown Construction Co., Cleveland, O., and construction will begin soon, with completion scheduled for late 1960. When complete, the new research center will accommodate Diamond's research department.

THE NATIONAL BUREAU OF STANDARDS, Washington, D. C., will begin publishing its *Journal of Research* in four separate sections, corresponding to subject matter fields, which may be subscribed for individually, effective July 1. The *Journal* is divided into the following sections, each available from the Government Printing Office: Section A: Physics and Chemistry; Section B: Mathematics and Mathematical Physics; Section C: Engineering and Instrumentation; and Section D: Radio Propagation. Also, the editorial scope of the *Journal* is being broadened to cover the Bureau's technical program as completely as possible. The *Journal* contains comprehensive research papers which give complete details of the work, including laboratory data, experimental procedures, and theoretical and mathematical analyses.

F.A.B. MFG. CO., Oakland, Calif., is producing a semi-trailer tandem unit to transport a mobile standby transformer weighing 96,000 pounds which has been put into service by the Pacific Gas & Electric Co. The new heavy-duty low bed trailer is supported by 32 B. F. Goodrich 7.50-15 12-ply Trailer Express tires. The trailer unit was designed and engineered jointly by F.A.B., Bigge Drayage Co., and P.G.&E. to provide emergency service wherever a power failure might occur. The complete unit, powered by any convenional highway Diesel tractor with semi-trailer fifth wheel hook-up, is limited to a maximum speed of 30 mph. on the highway.

THE GENERAL TIRE & RUBBER CO. has announced in connection with availability of its SBR black masterbatch Gentro-Jet SAF, that this dispersant-free material should provide about one-third greater tread wear. Tires made from the masterbatch have been road tested in Texas and tested in the laboratory at General's Akron, O., research headquarters.

GENERAL ELECTRIC CO.'S silicone products division, Waterford, N. Y., is supplying RVT-60 silicone rubber for use as a sealant in Lockheed's Kingfisher, a recoverable Army target missile which lands via parachutes and a nose spike. The silicone rubber is used to seal the entire fuselage to insure that the missile would withstand internal and external pressures. Cost of sealing ran about $370 per missile, giving a savings of approximately $1,600 per vehicle over a previously used organic sealing material. The probability of recovering the Kingfisher missile has been vastly improved owing to the RTV silicone rubber sealant.

EMERY INDUSTRIES, INC., has moved its Chicago office to new quarters at 6835 W. Higgins Ave., Chicago 31, Ill. The office will serve as headquarters for Joseph E. Quinty and Paul N. Leech, sales representatives for Emery's organic chemical and fatty acid sales departments, respectively, in a five-state territory surrounding Chicago.

ARMOUR CHEMICAL DIVISION, Chicago, Ill., has reduced the price of its tertiary amines following completion of new production facilities at its McCook, Ill., plant. Prices are being reduced 16 to 31%, or from 13 to 25¢ a pound. These chemicals are used as urethane foam catalysts where they are said to improve cell structure and other properties and to produce cured foams with a low odor level.

DOW CORNING CORP., Midland, Mich., in connection with the Design Engineering Show May 25, in Philadelphia, Pa., issued a number of special issues of *Silicone News* on the theme, "Silicones Simplify Design." Included were mention of Silastic silicone rubber for cable required by Convair's B-58 Hustler which could operate in the temperature range of —55 to 350° F. without significant change in electrical properties; Silastic for sealing the lead and thermocouple wiring area in Sunbeam's automatic frypan; and Navy shipboard cable insulated with silicone rubber which saves space and does not short circuit in the event of fire. Atomic powered ships utilize silicone rubber cables in the reactor area because of the high ambient temperatures.

BORDEN CHEMICAL CO.'S Resinite Department, North Andover, Mass., and Santa Barbara, Calif., has developed a new, transparent, fungus-resistant vinyl insulation sleeving, designated Resinite EP-69-C. The new material conforms to the requirements of Navy Specification MIL-I-631C, grades a and b, for electrical insulation applications. Designed primarily for use in aircraft, EP-69C also is expected to find wide application in the automotive industry. It is reported to have low-temperature flexibility to —75° F., high-temperature stability to 185° F., and dielectric strength to 900 volts per mil of wall thickness.

THE FIRESTONE TIRE & RUBBER CO., Akron, O., on its golden anniversary of automobile racing was paid tribute by the Indianapolis Motor Speedway for its many contributions to the progress and safety of automobile racing. The award, in the form of a commemorative plaque, was presented to Raymond C. Firestone, president of the company, over a nationwide television network by Tony Hulman, president of the Speedway. In making the presentation, Hulman announced that no other company has made greater contributions to automotive safety, both on the speedway and on the highway, than Firestone.

MANUFACTURING CHEMISTS' ASSOCIATION, INC., Washington, D. C., has awarded certificates of achievement to 430 chemical plants which were operated throughout 1958 without a single disabling injury. Forty-four MCA member firms are represented on the list. MCA awarded 397 such certificates for 1957 among 46 companies. To qualify for the certificate, in addition to its injury-free record, a plant or laboratory must be a self-contained unit of its parent company, must have worked a minimum of 20,000 man-hours, and must be engaged in chemical manufacturing operations or research.

W. J. VOIT RUBBER CORP., a subsidiary of American Machine & Foundry Co., has started construction on a new research and development building on Voit's 37-acre plant site in Santa Ana, Calif. The 15,000-square-foot building will house all Voit research and development personnel in a single facility large enough to meet the needs of the near future and provide for orderly expansion later on. With ground-breaking ceremonies on May 12, occupancy of the new building is scheduled for August 31, 1959. Total building construction cost will run to about $300,000, not including cost of equipment for development and testing of pilot-plant and production models of equipment, products, or processes.

E. I. DU PONT DE NEMOURS & CO., INC., through its textile fibers department, sponsored the fourth annual tire yarn review recently at Akron, O. Technical papers covering the processing of tire yarns and experimental work with tires were presented by members of four technical organizations within the Du Pont department. Results of cooperative testing programs and long-range studies on fiber improvements and tire design were reported.

THIOKOL CHEMICAL CORP., Trenton, N. J., sponsored a national Building Industry Forum, May 20, at the Ambassador Hotel, Los Angeles, Calif. Seven well-known California and West Coast architects and building materials experts served on the panel, which discussed how proper use of new materials such as sealants based on polysulfide rubber can solve the problem of permanently sealing and weatherproofing modern non-residential construction. Emphasis was on the popular curtain wall types with their large expanses of metal and glass.

HOLLEY CARBURETOR CO., Detroit, Mich., has announced that its truck carburetors now use U-cups of Viton on the piston of the accelerating pump in certain current production models and for service replacement in the field. According to Holley, the excellent dimensional stability of Viton fluorine-based synthetic rubber in the presence of highly aromatic fuels resulted in its adoption for the small, but critical piston seal. The U-cups are manufactured by Houghton Vix-Syn Co., Hopkins, Minn. The Viton is supplied by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

REPUBLIC RUBBER DIVISION, Lee Tire & Rubber Co., Youngstown, O., recently replaced all floor-mounted steamheating pipes with overhead revolving heaters in a planned program to give more efficient heat distribution throughout its manufacturing facilities. Since the program began, Republic has installed in recently erected buildings and in existing areas a total of 37 overhead-type heaters. These were supplied by L. J. Wing Mfg. Co., Linden, N. J.

THE DAYTON RUBBER CO., Dayton, O., is establishing a new warehouse and regional sales office at 7726 Reinhold Dr., Cincinnati, O. The modern brick and concrete building is expected to be completed by July 1. V-belts, along with hose and other automotive and industrial products, will be involved in the Cincinnati operation. Establishing regional warehouses and sales offices ties in with the company's overall plan to improve customer service and product distribution.

HOOKER CHEMICAL CORP., with headquarters in Niagara Falls, N. Y., has established an office in London, England, at 16 Stratton St., London W.1, as a base for liaison between the American firm and European companies with respect to both chemicals and plastics. Hooker's representatives will primarily contact European research and development organizations and industrial firms. Their four major objectives are: to keep abreast of chemical and plastics research and development in Europe; to seek new products and processes for utilization in the United States; to investigate possible joint ventures in Europe and in the United States; and to assist in bringing to Europe new developments pioneered by Hooker and making them available for foreign use.

THE GOODYEAR TIRE & RUBBER CO., Akron, O., is now producing improved nylon fabric-reinforced high-speed tire treads for new commercial jet airliners, providing the utmost in dependability and safety. Fabric-reinforced treads were first produced by Goodyear to meet Air Force specifications for tires on high-speed military planes. Goodyear has also developed a new fabric-reinforced retreading process, the retreads from which have passed new tire dynamometer tests after simulating conditions and ground speeds of the modern jets. Delivery of the new fabric-reinforced jet tires already has been made to Boeing Aircraft Co., among others, the company reported.

SUNELEC, INC., Trenton, N. J., is offering commercially a new type of flexible heating tape which conducts electricity without wires, can be cut to any length, and maintains a uniform temperature on its surface. The tape is made of woven glass fibers impregnated with conductive silicone rubber. Expected to be useful in the plastics industry and in the solution of a variety of heating problems, the tape reportedly can withstand continuous temperatures at 400° F. and up to 600° F. for short periods. Also, the tape does not become brittle at very low temperatures, according to the firm.

FOOD MACHINERY & CHEMICAL CORP.'s chemical divisions have started a major addition to the central chemical research laboratory at Princeton, N. J. The expansion, in the form of a new wing, will add more than 50% to the laboratory floor space. Slated for use in February, 1960, the new section will cost about $1 million. The firm's recently formed inorganic chemicals research and development department will occupy most of the new wing, using it to increase product application and sales-service activities.

MONSANTO CHEMICAL CO., Springfield, Mass., has shipped the plastics industry's first 100,000-pound bulk shipment of styrene molding material to Amos Molded Plastics in Edinburg, Ind., one of the country's largest custom molders. A covered hopper car, loaded and unloaded pneumatically, was used to make the shipment of the company's white Lustrex high-impact molding material. Monsanto reports that bulk receiving can result in definite in-plant economies for volume users of plastics raw materials, depending on types of materials handled, the equipment used, and the plant layout.

DU PONT CO. (UNITED KINGDOM) LTD. has opened a new modern laboratory devoted to developmental work on neoprene and other synthetic rubbers and rubber chemicals for the European rubber industry at Hemel Hempstead, near London, England. The laboratory, officially designated the elastomers research laboratory, is the first permanent facility to be completed by Du Pont in Europe. It will be used to provide technical assistance to rubber manufacturers and processors in Europe, Africa, Australasia, and parts of Asia. The company also has a neoprene plant nearing completion in Londonderry, Northern Ireland.

UNION CARBIDE CHEMICALS CO., division of Union Carbide Corp., has doubled its capacity to produce polyether polyols at its South Charlestown, W. Va., plant. During the past year Carbide has developed and introduced eight polyethers, under the trade mark Niax, for use as starting materials in foam manufacture. These polyethers make possible the wide variation in physical properties of foams, which range from completely rigid to soft and flexible. Urethane resin producers can thus be assured of an adequate supply of Niax polyols to support the continuing growth of the polyether urethane industry.

U. S. RUBBER RECLAIMING CO., INC., Buffalo, N. Y. has announced the recovery of nylon from discarded automobile tire carcasses through a simple chemical process. An eight-month program by the product development section of Arthur D. Little, Inc., Cambridge, Mass., led to the process which recovers and purifies the nylon. The ADL recovery system is said to remove all contaminants from the nylon which heretofore had been considered a waste product of U. S. Rubber Reclaiming's dry mechanical reclaiming process. Mechanical properties of the recovered nylon are now substantially equivalent, in most respects, to the virgin variety for such purposes as molding, says the firm.

CHEMORE CORP., general representative in the United States and Canada for Montecatini Soc. Gen., Milan, Italy, has moved its offices to new and larger quarters at 2 Broadway, New York 4, N. Y. New telephone number is BO 9-5080. As Montecatini's representative, Chemore markets a wide variety of chemicals, plastics, and dyestuffs. It has been instrumental in negotiating license agreements with several leading U. S. chemical firms for various processes developed by Montecatini.

MARTIN RUBBER CO., INC., Long Branch, N. J., is offering a No. 14-B shower-type spray, containing the Fits-All faucet connection, 5½ feet of tubing, and a massage brush head, which is attached with a unique ball joint to a large suction cup, enabling the unit to be attached securely to a wall. A patented Quick-Release Knob enables the user to break the suction at once without difficulty, so the spray can be readily removed and placed elsewhere.

ARMSTRONG RUBBER CO. has placed a contract for the construction of a three-floor 600,000-square-foot warehouse to be located in West Haven, Conn., with the Worsham Construction Co., Denver, Colo. The new warehouse, to be completed in May, 1960, will be located near the company's plant on Saw Mill Road. It will be connected with the plant by a conveyor system which will carry finished tires and tubes to the warehouse.

THE DAYTON RUBBER CO., Dayton, O., will soon begin production of Poly-V Power Transmission Belts as a result of an exclusive licensing arrangement with Raybestos-Manhattan, Inc., Passaic, N. J. The latter firm developed the Poly-V Belt which features parallel ribs on the inner surface matching corresponding ribs on the sheaves. These new belts, coupled with Dayton's complete line of V-belts, will extend Dayton's coverage in the power transmission field to areas not previously covered. Dayton Rubber will market the new line through its present extensive field sales organization. Raybestos-Manhattan will continue to make and distribute Poly-V Belts through its own sales organization.

THE W. W. SLY MFG. CO., Cleveland, O., has appointed two companies as representatives of its dust-control systems, industrial ovens, blast-cleaning equipment, and tumbling mills. Formation of the Sinclair-Brandt Equipment & Supply Co., 6620 Dixie Dr., Houston, Tex., permits expanded sales and service in Texas. Delvin Brothers, 1003 Maritime Bldg., New Orleans, La., has been made Louisiana representative.

NEWS about PEOPLE

James T. Grey, recently scientific advisor to the director of research and development in headquarters, USAF, has been appointed director of the research planning staff, rockets division, Thiokol Chemical Corp., Trenton, N. J. In his new assignment Dr. Grey will concentrate on the coordination of the current research programs and the formulation of long-range research activities. His other responsibilities will include the study of the problem of non-military or commercial applications for rockets, rocket components, and propellants.

L. S. Hilton has been appointed manager of the abrasive and diamond wheel departments of the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J. He succeeds **J. A. Lange,** who requested to be relieved of managerial responsibilities in order to devote his knowledge and 43 years experience to improving methods and quality. **C. Fleming, Jr.,** has been appointed production and development manager. New sales executive appointments include **S. R. Delaney,** sales manager, and **A. J. Verrinder,** assistant sales manager. Technical superintendents also named are **D. B. Bell** and **L. A Benson. T. Gordon** has been made field engineer for diamond wheel sales to replace **H. Ahlers,** who is retiring.

G. B. DeHuff has been advanced to manager of the tire assembly department at Plant 1, The Firestone Tire & Rubber Co., Akron, O. He had been general foreman in the department. **C. B. Ryan,** manager of the stock preparation department at Plant 2, has been named to a managerial post at the firm's Memphis, Tenn., plant. **C. F. Kukula** succeeds Ryan at Plant 2. The former was formerly manager of the production scheduling department at Plant 2.

Robert F. Bourke has joined the sales staff of Commercial Solvents Corp., according to F. E. Maple, sales manager of the industrial chemical department. Bourke will headquarter at the company's regional office at 110 Sutter St., San Francisco, Calif.

William C. Martin has been named manager of The General Tire & Rubber Co.'s chemical division Ashtabula, O., plant. **Robert W. Laundrie** becomes manager of the division's Mogadore, O., plant, and **Louis E. Gressingh** has been appointed technical superintendent at Mogadore.

Theodore T. Kryza has been appointed to the newly created position of manager of industrial sales, The Paterson Parchment Paper Co., Bristol, Pa. Industries which Kryza will cover include the chemical, rubber, plastics, bakery, candy, food processing, food packaging, electrical, paint, and industrial packaging.

John L. Collyer, chairman of The B. F. Goodrich Co., Akron, O., and **William S. Vaughn,** vice president and general manager of Eastman Kodak Co., Rochester, N. Y., were elected directors of Eastman Kodak at the annual meeting of shareholders in Flemington, N. J., April 28.

James R. Andreas, formerly assistant purchasing agent for Rubbermaid, Inc., Wooster, O., has been assigned the new position of marketing and advertising administrator.

John G. Broughton, Jr., has been appointed to the newly created position of field sales manager of the organic chemicals division, Dewey & Almy Chemical Division, W. R. Grace & Co., Cambridge, Mass. Broughton, eastern regional sales manager since 1955, will have direct charge of the national sales from Cambridge. Succeeding Broughton as eastern manager will be **Arthur D. Patrick,** formerly a sales representative, who will headquarter in Clifton, N. J. **Amos J. Miner** has been named Midwest regional sales manager at Chicago, Ill. He succeeds **William A. Morton,** who in March was appointed assistant research manager of the organic chemicals division. This division supplies vinyl acetate polymers and copolymers, butadiene-styrene latices and resins, plasticizers, and dispersing agents to the paint, paper, adhesives, textile, rubber, and plastics industries.

Clifford S. Farmer has been made treasurer of B. F. Goodrich Footwear & Flooring Co., Watertown, Mass. He succeeds **Thomas P. Brown,** who is retiring.

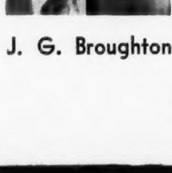
James A. Cruickshank has been named general sales manager of Naugatuck Chemicals, Division of Dominion Rubber Co., Ltd., Elmira, Ont., Canada. He will direct the sales of all Naugatuck products, including plastics resins, agricultural chemicals, rubber chemicals, and general industrial chemicals. He will headquarter at the Naugatuck offices in Elmira.

Laurence R. Keltner becomes senior divisional engineer for B. F. Goodrich Tire Co., a division of The B. F. Goodrich Co., Akron, O. He formerly served as manager of tire compounding. He was superintendent of the company's Akron tire plant in 1946 and tire plant manager at Los Angeles from 1947 to 1951. He returned to Akron as director of employe relations.

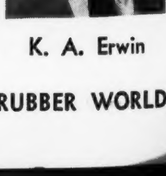
Arthur S. Armstrong, president and general manager of the Cleveland Twist Drill Co., and **Clark H. Johnson,** vice president in charge of sales for United Engineering & Foundry Co., Pittsburgh, Pa., have been elected directors of the latter company, replacing **John Quinn** and **James S. Crawford,** who have retired from the board after many years' service.

Edwin Bryant Gale has been named branch manager of the Lee Tire factory branch, The Lee Rubber & Tire Corp., at 2001 New York Ave., N.E., Washington, D. C. He will direct the sales and service in the District of Columbia, lower Maryland, and northern Virginia.

Kenneth A. Erwin has been named administrative manager of the research and development department of Marbon Chemical Division, Borg-Warner, Washington, W. Va. For the past 11 years he has been associated with the General Electric Co., serving in laboratory, administrative, and engineering capacities.



J. G. Broughton



K. A. Erwin

Lawrance K. Keogh has joined Tyrex, Inc., New York, N. Y., and will handle special assignments in the metropolitan New York area. **H. L. Baumgardner, Jr.,** has been assigned to the Detroit, Mich., office; and **Patrick Montroy** has joined the newly established Chicago, Ill., office. They will maintain liaison with fleet operators, major contractor accounts, and retail tire outlet in behalf of the new Tyrex viscose tire cord.

John T. Dunn has been appointed sales manager of the chemical division, Thiokol Chemical Corp., Trenton, N. J. Formerly sales manager of Thiokol's butyl sales, Dunn is now responsible for the sales of polysulfide rubber, liquid polymers, and rubber chemicals. He reports to **Donald E. Fish,** director of marketing for the chemical division.

Lawrence T. Jilk, assistant manager of the planning division of the polychemicals department, E. I. du Pont de Nemours & Co., Inc., has been named manager of the newly created planning division of the elastomer chemicals department. Dr. Jilk joined Du Pont in 1937 as a chemical engineer at the company's Belle, W. Va., works and during his career with Du Pont has held a number of positions.

Roger A. Murray has joined the research department of Monsanto Chemical Co.'s research and engineering division, Dayton, O., after having served with the plastics division at Springfield, Mass. Also, **Keun Y. Kim** has joined the research department of Monsanto's inorganic chemicals division, St. Louis, Mo.

M. R. Rodman, manager of Seiberling Rubber Co.'s credit department, has been elected assistant treasurer of the Akron, O., firm, but will continue to serve also as credit manager. All other officers of the company were reelected except **H. E. Thomas,** assistant secretary-treasurer, who retired April 30.

H. G. Dusch has been elected vice president-finance of Goodall Rubber Co., Trenton, N. J., according to **F. R. Williamson, III, president.** Dusch, secretary-treasurer since 1944, will also continue as secretary. Also, **A. E. Blanchar,** formerly controller, assistant treasurer, and assistant secretary, has been elected treasurer. He will continue as controller.

Alex J. Keller has been named manager of manufacturing of Oliver Tire & Rubber Co., Oakland, Calif. He has past associations with Chardon Rubber Co., Stewart Bolling Co., and The General Tire & Rubber Co.

Stacy F. Wolfe has been named sales manager of the Foamex division, Firestone Rubber & Latex Products Co., Fall River, Mass., and **Harry A. Stawniak** has been appointed sales manager for mechanical rubber goods, elastic thread, and other items made by the company. Also announced was the resignation of **William W. Llewellyn** as vice president and general sales manager; his position remains temporarily unfilled. Wolfe will handle sales of all foamed products to the furniture, bedding, and related industries. Both Wolfe and Stawniak will headquarter at Falls River.

H. A. Stawniak

S. F. Wolfe

Everett J. Weaver becomes sales representative of the aromatic and odor control division of Rhodia, Inc., New York, N. Y., for the state of Texas, headquartering in Houston, according to **J. P. Leroux,** sales manager.

Joseph P. Wronski has been appointed head of the physics section, United States Asbestos—Grey-Rock Division of Raybestos-Manhattan, Inc., Manheim, Pa. Most recently he worked for the Westinghouse Bettis Atomic Power Division in Pittsburgh, Pa., providing technical administration of prime contracts for complete nuclear reactor cores under the Pittsburgh Naval Reactors Operations Office. Also, **Peter L. Shanta** has been made assistant director of research and development of the Division. He was formerly technical director of the Taylor Fibre Co., where he was responsible for the resins research group, laminated plastics development group, the paper research group, the vulcanized fiber development group, and all technical sales services.

Joseph C. Allwarden becomes sales representative for the Cleveland district (Michigan territory) of the silicone products department, General Electric Co., headquartering at 2211 Woodward Ave., Detroit, Mich. His background includes experience in sales and product planning for G-E's medium induction motor department as well as sales forecasting and personnel development for the small a.c. motor and generator department.

Austin Kuhns, senior vice president of Farrel-Birmingham Co., Inc., Ansonia, Conn., retired April 1 after 36 years with the concern. He joined the then Farrel Foundry & Machine Co. at its Buffalo, N. Y., division on November 1, 1922, as a sales engineer. In 1934, he was made executive engineer in charge of marine engineering and sales. In 1943, he was elected a director of the company and became vice president in charge of development and research, headquartering in the New York, N. Y., office. In May, 1951, he became vice president and consulting engineer and was transferred to Ansonia. He was elected senior vice president on March 15, 1956.

William J. Parmley has been named works manager of the Kenton, O., plant of the Durez Plastics Division of Hooker Chemical Corp. He was plant superintendent since July 1, 1958, when he moved to Kenton from the North Tonawanda, N. Y., plant.

J. W. L. Fordham has been appointed manager of the research and development department of Diamond Alkali Co.'s plastics division, Cleveland, O. He comes to the division from Diamond's central research department in Painesville, O., where he was group leader. At his new post he will be assisted by **Jack Zimmerman,** who continues as assistant manager. Zimmerman will also work closely with personnel of the company's Deer Park, Tex., plant and central engineering in proposed new plant additions and expansions.

J. C. R. Warren has been named coordinator, research and development, Dominion Rubber Co., Ltd. He will act as coordinator of all research and development activities of the various divisions of Dominion Rubber and will be responsible for the company's research laboratory at Guelph, Ont., Canada, where he will make his headquarters.

D. R. Caskie, treasurer, has been elected to the board of directors of the Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., Canada. He has served 30 years in the company's administration and finance division and has held a number of executive posts through the years; he was appointed treasurer in 1957.

Eugene D. Conroy has been named sales engineer for the battery separator department of United States Rubber Co., Providence, R. I. He has been with the firm's Chicago sales organization since 1945 when he left Douglas Aircraft to join the rubber company. Prior to his latest appointment he was serving as a field sales specialist.

News about People


N. Y. Times — Madison Geddes

E. M. Berberian — J. R. Draves

Edward M. Berberian has joined Columbian Carbon Co. as technical salesman for its carbon black and pigment division. He will be stationed in the New York, N. Y., office and will cover the northern New Jersey sales territory. He will report to **Jack Stiff,** eastern district sales manager.

Robert A. Blomquist, formerly of J. T. Baker Chemical Co., and **Peter W. Hill,** former Houdry development engineer, have joined the chemical sales department at Houdry Process Corp., Philadelphia, Pa. Hill will concentrate on market research. Both will report to **Philip A. Burghart,** director of chemical sales.

W. R. Clarke has been named production manager of the Eastern Hemisphere for the Firestone International Co. He formerly was operating assistant for **H. H. Wiedenmann,** production manager, U. S. tire plants of the Firestone Tire & Rubber Co., Akron, O. Clarke will leave in June to spend six months at the Bombay, India, plant and will then make his headquarters in Akron. **G. A. Carlisle, Jr.,** production manager at Plant 2, succeeds Clarke as operating assistant. **I. B. Terjesen,** division manager at Plant 1, was named to succeed Carlisle as Plant 2 production manager.

Russell C. Weigel has been elected president and director for the next two years, effective June 1, of The Society of the Plastics Industry, Inc., New York, N. Y. Weigel, assistant general manager of the polychemicals department, E. I. du Pont de Nemours & Co., Inc., is the fourteenth president of this 22-year-old trade association. The retiring president, **C. Russell Mahaney,** who is vice president and director of St. Regis Paper Co., and general manager of its Panelyte division, was elected director and chairman of the board of SPI for the next two years. The newly elected vice president and director of SPI is **Robert L. Davidson,** vice president of Kurz-Kasch, Inc., and the new secretary-treasurer and director is **E. J. Caughlin,** president of American Insulator Corp., New Freedom, Pa.

John R. Draves has joined Goodrich-Gulf Chemicals, Inc., Cleveland, O., as a sales engineer assigned to the New England area, according to **J. E. Miller,** vice president, sales.

Orville E. Isenburg, formerly general manager of Harmon Color Works, of The B. F. Goodrich Co., has been selected as managing director of B. F. Goodrich Iran S. A., a newly organized subsidiary of The B. F. Goodrich Co. The new plant will manufacture tires and tubes in a plant now under construction at Tehran, Iran.

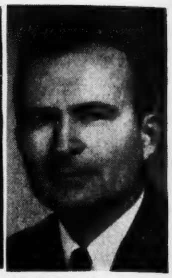
Herbert R. Erickson, development manager of Borden Chemical Co.'s Resinite department plant in North Andover, Mass., has assumed the additional responsibilities of operations manager. He succeeds **H. L. Bartlett,** plant manager, who has retired and will enter his own business. Erickson will be responsible for the development, production, and engineering departments of the North Andover operation.

R. Karl Van Leer has been appointed marketing research specialist in organic chemicals, Dewey & Almy Chemical Division, W. R. Grace & Co., Cambridge, Mass., according to **Albert W. Warren,** marketing research manager. Van Leer was formerly with Dow Chemical Co.

Herbert P. Buetow, president of Minnesota Mining & Mfg. Co., St. Paul, Minn., has announced the election of six divisional vice presidents: **H. H. Heltzer,** reflective products division; **R. V. Holton,** electrical products division; **C. C. Smith,** retail trades tape division; **R. H. Herzog,** duplicating products division; **C. W. Walton,** adhesives, coatings, and sealers division; and **W. W. Wetzel,** magnetic products division. Each was formerly manager of his respective division. Also, **L. B. Gehrke** has been elected assistant treasurer.

Frank Slezak has been appointed group leader of the polymer section of Diamond Alkali Co.'s research department, Painesville, O., according to **Thornton F. Holder,** director of research.

Elmer F. Myers, recently made assistant district manager of the Akron, O., territory for Farrel-Birmingham Co., Inc., with offices at 665 W. Market St., Akron, O., has now been appointed manager of the territory. He succeeds **William R. Bowen,** who will transfer to company headquarters at Ansonia, Conn., to take the post of research and development engineer.

Chell Frantzen

O. E. Isenburg — R. J. Love

Raymond J. Love has been elected vice president of Bishop Mfg. Corp., Cedar Grove, N. J., according to **Pendennis W. Reed,** president. Love joined the company in January, 1958. Prior to that he had been factory manager of Pequanoc Rubber Co.

Peter DePaolo, veteran Indianapolis race driver, has joined The Firestone Tire & Rubber Co., Akron, O., as a speaker to help enroll schools in the Student Traffic Safety Program. This student safety program is a service of the National Education Association's Commission on Safety Education and is supported by Firestone.

Walter J. Dugan, Jr., has been appointed manager—rubber market development for the silicone products department, General Electric Co., Waterford, N. Y. He will direct market research, sales planning, and technical service for the department's silicone rubber product line. Formerly manager—sales development for the silicone products department, Dugan has been with G-E since 1948.

M. W. Mebane, formerly manager of the Redstone division, Thiokol Chemical Corp., has been appointed secretary of the corporation. Dr. Mebane will headquarter at Bristol, Pa. His responsibilities will include corporate personnel, patents and public relations. **J. W. Wiggins,** assistant divisional manager, Redstone, has been named manager of the Redstone division, Huntsville, Ala.

Edward L. Kennedy, a partner in the investment banking firm of Lehman Brothers, and **Edwin B. Brooks,** vice president in charge of the carbon black and pigment division, Columbian Carbon Co., and a director of Columbian Carbon International, Inc., have been elected to the board of directors of Columbian Carbon Co., New York, N. Y. Kennedy is also a director of Kerr-McGee Oil Industries, Inc., Republic Natural Gas Co., Murphy Corp., and Kermac Nuclear Fuels Corp., and is chairman of the board of the Eberhard Foundation for Medical Research.

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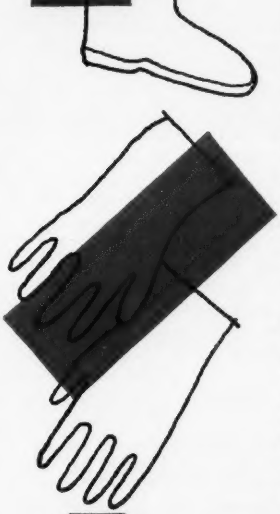

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NOTE:
AZO rubber grade zinc oxides are also available as AZODOX (de-aerated). AZODOX has twice the apparent density, half the dry bulk.

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Dover R. Fouts, former general manager of Brazilian operations for J. I. Case Co., has been named general sales manager of B. F. Goodrich do Brazil, a newly created subsidiary of The B. F. Goodrich Co., Akron, O. Fouts, who has been engaged in international sales since 1948, joined the International B. F. Goodrich Co. in December. He will supervise organization of the company's sales office at Sao Paulo, Brazil.

Robert E. Soden, manager of Monsanto Chemical Co.'s Nitro, W. Va., plant, has been appointed manager of the William G. Krummrich Plant at Monsanto, Ill. He succeeds **Joseph Cresce,** being loaned to Monsanto Chemicals Ltd., England. **Paul W. Edwards,** manager of Monsanto's Avon Calif., plant, has been named plant manager at Nitro, W. Va.; while **Karl Ellingson,** general manufacturing superintendent at the St. Louis, Mo., plant, has been designated plant manager at Avon.

Charles E. Goebel is now research director of Emery Industries, Inc., Cincinnati, O. Other promotions include: **Victor J. Muckerheide,** to technical coordinator; **Karl T. Zilch,** to succeed Muckerheide, as manager of the process research section; **Louis M. Wise,** to manager of Sanitone research section; and **H. Fred Oehlschlaeger** and **Fred O. Barrett,** as managers, respectively, of the newly created derivatives research section and polymerization research section, dividing the activities of the former organic chemicals research section.

Herbert Hoover, Jr., son of the thirty-first president of the United States, was elected to the finance committee of Monsanto Chemical Co., St. Louis, Mo., by the board of directors. Hoover, an independent consulting engineer, has been a member of Monsanto's board since last December.

Alan G. Richards has been elevated to the vice presidency of Bjorksten Research Laboratories, Madison, Wis. He has been affiliated with Bjorksten as manager of client relations for three years, half of which was spent at the firm's Washington, D. C., office. In addition to assuming new management duties, he will continue his activities in the field of client relations and will now make his headquarters in Madison.

A. V. Baracani has joined the Dewey & Almy Chemical Division, W. R. Grace & Co., as organic sales representative in the Chicago, Ill., office, according to **Charles E. Brookes,** organic chemicals sales manager. Baracani will sell Dewey & Almy's vinyl acetate polymers and copolymers, styrene-butadiene resins and latices, plasticizers, and dispersing agents, in Illinois, Indiana, Iowa, Missouri, and Nebraska.

Bruce L. Dwiggins has been appointed production superintendent of Michigan Chemical Corp.'s new magnesium oxide plant at Port St. Joe, Fla. The plant is expected to go on stream this July. Other promotions in connection with the new seawater MgO plant include **Charles R. Jacoby** as process engineer and **Charles E. Ewing** as control chemist. The company also announced the promotion of **Donald W. Kase** to production engineer, assisting the company's director of operations, **A. J. Romanski,** who is stationed at Saint Louis, Mich.

OBITUARIES

Arthur Wolf

Arthur Wolf, one of the government's top experts on rubber, died of cancer in Washington, D. C., May 20, at the age of 49. Active in government rubber work since before the war, Mr. Wolf was director of the Office of Civil & Defense Mobilization's rubber, agricultural, and forest products operations.

Mr. Wolf was scheduled to represent the government at the mid-May meeting of the International Rubber Study Group in London, but was prevented by his illness. He had been the United States representative to a number of earlier IRSG meetings.

A specialist on national defense requirements for rubber in peace and war, Mr. Wolf figured prominently in the Navy's determination of its rubber needs during the wartime shipbuilding program. In recognition of his services, the Navy in 1945 gave him a merit award for his work on the Navy Rubber Survey Committee and the rubber bureau of the War Production Board.

Two years ago, he served as staff director of the so-called Pettibone National Stockpile Advisory Committee, a group of businessmen-experts which surveyed the government's stockpiling program.

A native of Waltham, Mass., Mr. Wolf was graduated from Tufts College and did graduate work in chemistry at Massachusetts Institute of Technology and Harvard University.

He is survived by his wife, a daughter and two sons.

Funeral services were held May 21.

William F. Harrah

William Ferguson Harrah, honorary chairman of the board and one of the founders of the National-Standard Co., died in Niles, Mich., April 16, after a period of failing health. Funeral services were held in the First Presbyterian Church, April 20, with burial in a mausoleum in Silver Brook Cemetery, Niles.

Mr. Harrah was born in Brookfield, Mo., November 12, 1871, and attended high schools in Galva and Peoria, Ill. He also attended Brown Business College, Peoria, and Grinnell College, Grinnell, Iowa.

His career with National Standard began when he helped found the National Cable & Mfg. Co., Niles, in 1907. In 1913, National Cable and Cook Standard Tool Co. merged, and Mr. Harrah became the first president of the new combined company, now named National Standard Co. He advanced to chairman of the board in 1934 and became honorary chairman in 1952.

Mr. Harrah is survived by his wife, a son, and two grandchildren.

John E. Bassill

John Edward Bassill, called "the rayon industry's Mr. President" by *Modern Textiles,* died April 17 from a heart attack.

During the early part of his career he held various positions with several companies, including the Firestone Tire & Rubber Co. He was president of Tubize Rayon Corp. from May, 1932, to February, 1946. Upon the merger of Tubize Rayon in 1946 into the Celanese Corp. of America, he was elected a vice president, director, and member of the executive committee.

Mr. Bassill became president of North American Rayon Corp. and American Bemberg Corp. in May, 1947. He resigned in December, 1948. He served as consultant to American Enka Corp. from 1950 until his death.

Mr. Bassill served as chairman of the executive committee and research

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and statistical committee of the Rayon Producers Group. He was also a member of the board of directors of the National Federation of Textiles and the Textile Research Institute.

The deceased was born on November 30, 1896, in Norristown, Pa., where he subsequently attended grade school and Schissler College of Business. He later attended the Evening School of Accounts & Finance, University of Pennsylvania, from which he was graduated in 1924. He also saw service in the Marine Corps during World War I.

A Requiem Mass was sung at the Church of the Holy Family, New Rochelle, N. Y., April 20. Burial was in the Gate of Heaven Cemetery, Valhalla, N. Y.

Mr. Bassill is survived by his wife, a daughter, and two grandchildren.

Sir George Beharrel

News has been received of the recent death, at the age of 85, of Sir George Beharrel, D.S.O., chairman of the Dunlop Rubber Co. from 1937 to 1949 and president from 1949 to 1957.

He was born in Yorkshire on March 11, 1873, and educated at Leeds University.

Sir George started his career in the offices of the North Eastern Railways, at York, where his flair for statistics was quickly recognized. During World War I his ability came to the attention of the British government, and in 1915 he received an appointment in the Ministry of Munitions, successively occupying posts of increasing importance. In 1919 he became Director General of Finance & Statistics in the newly formed Ministry of Transport and was knighted in the same year.

In 1922 the deceased joined Dunlop, becoming managing director the following year. Together with the chairman of the time, Sir Eric Geddes, Sir George reorganized the company when its range of manufactures was considerably extended.

Other important positions held by Sir George were: president of the India Rubber Manufacturers Association and of the Society of Motor Manufacturers & Trades; chairman of the Sixth International Congress of Scientific Management; member of the advisory panel representing manufacturers on the International Rubber Regulation Committee. In 1941, he was appointed chairman of the Rubber Control Board.

After World War II, Sir George represented British rubber manufacturers at meetings of the International Rubber Study Group at Washington, London, and The Hague. In 1957 he became honorary consultant to Dunlop.

In addition to the distinctions conferred on him by the British Government were honors from the governments of Belgium, Italy, and the Netherlands.

CALENDAR of COMING EVENTS

June 15-September 4
Gordon Research Conferences. Colby Junior College, New London, N. H.; New Hampton School, New Hampton, N. H.; Kimball Union Academy, Meriden, N. H.

June 19
Akron Rubber Group. Outing. Firestone Country Club.

Boston Rubber Group. Outing. Andover Country Club, Andover, Mass.

June 22-26
American Society for Testing Materials. Annual Meeting. Atlantic City, N. J.

June 26
Detroit Rubber & Plastics Group, Inc. Outing. Western Golf & Country Club.

July 24
Chicago Rubber Group. Golf Outing. St. Andrews Country Club.

August 4
New York Rubber Group. Golf Tournament. Forsgate Country Club, Jamesburg, N. J.

August 21
Philadelphia Rubber Group. Golf Outing. Manufacturers Golf & Country Club.

September 12
Connecticut Rubber Group. Outing.

September 24
Fort Wayne Rubber & Plastics Group.

October 2
Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.

Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

October 6
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

October 8
Southern Ohio Rubber Group. Gibbons Hotel, Dayton, O.

October 13
Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.

October 16
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.

Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 19-21
Ninth Canadian High Polymer Forum. Guild Inn, Toronto, Ont., Canada.

October 23
Akron Rubber Group. Sheraton Hotel, Akron, O.

October 26-31
International Standards Organization Technical Committee 45 on Rubber. Henry Hudson Hotel, New York, N. Y.

November 5
Rhode Island Rubber Club. Fall Meeting. Pawtucket Country Club, Pawtucket, R. I.

November 6
Philadelphia Rubber Group. Fall Dance. Manufacturers Golf & Country Club.

Connecticut Rubber Group.

November 9-13
International Rubber Conference. Division of Rubber Chemistry, ACS; Committee D-11, ASTM; Rubber & Plastics Division, ASME. Shoreham Hotel, Washington, D. C.

November 29-December 4
American Society for Testing Materials. Annual Meeting. Chalfonte Haddon Hall, Atlantic City, N. J.

December 3
Fort Wayne Rubber & Plastics Group.

December 8
Buffalo Rubber Group. Christmas Party. Buffalo Trap & Field Club, Buffalo, N. Y.

December 11
Detroit Rubber & Plastics Group. Christmas Party. Hotel Statler, Detroit, Mich.

Boston Rubber Group. Christmas Party. Hotel Somerset, Boston, Mass.

December 12
Southern Ohio Rubber Group. Christmas Party. Miami Valley Country Club, Dayton, O.

December 18
New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.

January 29
Akron Rubber Group. Sheraton Hotel, Akron, O.

February 5-7
Boston Rubber Group. Ski Week-End.

February 11
Fort Wayne Rubber & Plastics Group.

NEWS from ABROAD

African Rubber Planting On the Increase

Africa has frequently figured in the news in connection with rubber planting schemes. Thus it is learned that the Government of Sierra Leone is studying local conditions and those in Liberia with a view to starting its own rubber plantings. Ghana's area under rubber is to be further increased; a 2,000-acre plantation is to be set out by R. T. Briscoe (Ghana), Ltd., in conjunction with the East Asiatic Co., of Copenhagen, Denmark. Already 600 acres have been planted with material obtained from Liberia.

Nigeria

Excellent progress is being made on the Dunlop estates in Nigeria, the company's 1957 report reveals; nearly 7,000 acres of virgin jungle have now been cleared, and 4,000 acres have been planted.

In Western Nigeria some uneasiness was caused among rubber growing companies by the government's proposal to subject rubber produced for export in that area to a Western Region Marketing Board. However, following discussions with Lord Reith, of the Colonial Development Corp., Chief Awolowo, the premier, announced that large-scale plantations would be exempt from the controls of the Board and would have complete freedom of operation. The Marketing Board was designed only to improve the quality of smallholder rubber for export.

Belgian Congo

Expansion of rubber growing is on the program of the government's Ten-Year Development Plan for Belgian Congo. The outlook for the rubber planting industry in Belgian Congo has been discussed by Pierre Miny, Honorary Director General of Agriculture and member of the board of directors of the Rubber Producers' Association of Belgian Congo.[1]

Early efforts to develop rubber plantations of the African *Landolphia* vines and *Funtumia elastica* trees, and of *Manihot Glaziovii*, from Ceara, Brazil, ended in failure. Progress with *Hevea* —introduced in 1896—was thwarted first by the use of seed from inferior varieties of trees and later by World War I, which interfered with a relatively large-scale program planned with seed imported during 1908-1910 from Ceylon and Malaya, so that by 1930 the total area of rubber planted by Europeans was only 7,638 acres, and exports in that year a mere 470 tons.

Planters began to import high-yielding budding material from the Far East in 1928, but real improvement started after the creation of the National Institute for Agronomic Studies of Belgian Congo (Ineac) in 1933. In 1945, the European acreage was 48,-889 hectares,[2] of which more than 25% was in bearing. Since 1950 the acreage has remained stationary around 58,000 hectares, chiefly because of replanting.

As to the size of the plantations, the 30 firms in the Belgian Congo Rubber Producers' Association had a total area of 44,700 hectares in 1956 (37,350 in bearing); two of the estates cover more than 5,000 hectares each; 12 range from 1,000-4,999 hectares; ten from 250-999 hectares; and six have 250 hectares.

Exports of rubber have risen from 2,397 tons in 1945 to 29,017 tons in 1956. In the latter year, most of the productive area yielded an average of 658 kilograms per hectare; 10,575 hectares gave an average of 544 kilograms per hectare. The estates of more than 2,000 hectares average more than 700 kilograms per hectare, and there are blocks which yield 1,200-1,400 kilograms per hectare. The yields compare rather well with results in Malaya and Indonesia, though, as the author points out, it must be remembered that the Congo estates are relatively young, while the Far Eastern estates include a large proportion of old plantings.

The area of smallholdings totals about 21,410 hectares; the area in bearing—less than half the total—yielded 2,717 tons in 1956.

Official figures give the total area under rubber in Belgian Congo as 79,845 hectares in 1956, that is about 200,000 acres; total exports in that year were 31,734 tons, and in 1957, 34,310 tons.

The climate and the soil of Belgian Congo are, on the whole, favorable to *Hevea* growing, and backed by the government's encouragement, the guidance of the Ineac and the accumulated experience of rubber growers, expansion of *Hevea* planting seems promising. Mr. Miny believes that average outputs of 1,000-1,500 kilograms per hectare may be expected from the new plantings. As to the economic life of estates, *Hevea* trees in the Congo show satisfactory growth and vigor, but as compared with those in the Far East, he would rate them at 80-85%; the big problem is bark renewal. He stresses that in their financing, companies operating in Belgian Congo must allow for the shorter economic life of the trees.

He concludes that while technical conditions are favorable to expansion of *Hevea*-growing in the Belgian Congo, the real difficulty is the scarcity of labor.

We may add that the Rubber Study Group reported total exports of 33,763 tons of rubber for Belgian Congo in 1957, of which Belgium took 13,898 tons, the United States 8,577 tons, and France 5,114 tons.

[1] *Rev. gén. caoutchouc*, June, 1958, p. 741.

[2] Hectare equals about 2.45 acres.

Kenya

Bicycle tires are to be produced in Kenya by two companies, it is learned: the East African Bata Shoe Co. has built a new factory equipped with the latest machinery and with output capacity of 200,000 tires annually. Avon India Rubber Co., is expected to be ready to start producing shortly.

New Research Head Arrives in Malaya

Sir Geoffrey Fletcher Clay arrived in Malaya late in April to assume duties as Controller of Rubber Research under the Ministry of Commerce and Industry. He will direct the $10,500,-000-a-year (Straits currency) research program and coordinate work now being undertaken by the Rubber Research Institute, Natural Rubber Development Board, and Rubber Producers' Council.

Interviewed on his arrival, Sir Geoffrey expressed himself as optimistic on the future of natural rubber. Increasing world prosperity and growing populations in addition to rapid industrial expansion, all pointed to ever-increasing demand and supply of rubber, so that natural rubber need have no fear of synthetics, he said. There should be no opposition and competition between natural and synthetic products, he added; instead there should be cooperation in the research into consumption and application of the various types of these materials. The components of latex and the characteristics of natural rubber which make it more suitable than synthetic for certain uses will be his special concerns.

Sir Geoffrey refused to give an opinion on the newly developed polyisoprene rubber for which high claims are made in the United States. On the other hand, the Minister of Commerce & Industry, Tan Siew Sin, stated before the Federal Council that this new rubber was not expected to have a serious effect on natural rubber, provided the price of the latter remained competitive. In any case, he pointed out, the truth of the claims of manufacturers of the polyisoprene product had yet to be demonstrated.

The *Straits Times* editorially expressed uneasiness over scepticism in this connection, for it is inclined to give the American chemists the benefit of the doubt.

"The post-war story of synthetic," it reminds its readers, "is too remarkable for polyisoprene not to be taken at practically face value."

Probable Effects of High Prices

The high prices now prevailing, what has caused them, what is behind heavy Communist buying, and, more particularly, what the effects of over-a-dollar (Straits currency) rubber are likely to be, these are the questions which have recently been agitating rubber circles.

It is admitted that speculation undoubtedly has influenced the upward trend, but it is also recognized that contributing, or rather predisposing causes have been the heavy Russian purchases during the months when rubber production in Malaya is lowest; the recent reentry of China on the Malayan market has, of course, not helped the situation.

The Rubber Replanting Board fears a slowing down of smallholder replanting, rightly foreseeing that smallholders will prefer to tap their old rubber trees to reap good profits now, rather than to cut them down in a replanting program many of them only half approve.

The Plantation Workers' Union is not happy about dollar-plus rubber; it prefers a stabilized, steady price which will give workers a steady income.

But more insistent is the fear that the sharp rise will divert and then convert more consumers to synthetic rubber and so give further encouragement to synthetic rubber production. This opinion, however, is far from general. The vice president of the Malayan Estate Owners Association, Gan Teck Yeow, certainly reflects the feeling of many here when, in a letter published in the *Straits Times*, he called the somber views on the results of the present high prices on the eventual position of natural rubber "lop-sided," and the fears expressed unrealistic.

Almost as though answering both the pessimistic and the optimistic view of high prices, a veteran planter, C. C. Curran, forecasts a "tidal wave in the outflow of rubber" causing a temporary slump in prices, if replanting is pushed ahead too rapidly. He spoke, he said, from the experience of the slumps of 1922 and 1932. He added his opinion that smaller estates of 100-500 acres should be allowed to carry out their own replanting programs without interference from the Replanting Board.

Production and Exports

Russia was Malaya's best customer for rubber in the first quarter of 1959, recent figures show. Of 291,993 tons exported then, Russia took 47,417 tons, or 16%. The United States came next with 43,132 tons, followed by Britain with 39,928 tons, and Japan with 28,777 tons.

Exports continued at a high level, also in April, so that with totals for the first four months at 388,157 tons, shipments have averaged close to 100,000 tons a month so far this year. Compared with the same period in 1958, there was a rise of 13%; average price was 89½ cents per pound, against 77½ cents last year.

It is noted that China made no purchases during the first four months of 1959 or for several months before. But she was reported to have bought 5,600 tons from Malaya early in May. Incidentally, it is stated here that China has been forced to return to the Singapore market because of difficulties with Indonesia over quality. In late April, however, she had contracted with Indonesia for 4,700 tons of rubber.

Rubber production in Malaya in the first quarter of 1959 reached 163,550 tons, slightly above the figure for the same period last year. Widespread, severe drought conditions caused a drop of 24% in February production, and the March output was not much higher; the final total for the quarter is therefore considered satisfactory.

Rubber imports totaled 106,770 tons for the first three months of 1959, 17% more than in the 1958 period.

Pelletized News

The reimposition of the anti-inflationary cess on rubber may be expected if the high price level continues. This cess will be in addition to the rubber export duty, a reduction of which the United Planting Association of Malaya has been urging, to offset the company income tax which has been increased from 30 to 40%.

B. F. GOODRICH IRAN, S.A., a newly organized subsidiary of The B. F. Goodrich Co., has started construction of a modern tire and tube plant in Tehran, Iran. Completion of the plant is slated for early 1961. The 130,000 square-foot plant is being built on a 40-acre tract adjoining the main line of the Iranian National Railroad. Three other BFG overseas plants are now under construction. A plant in Campinas, Brazil, is being built by B. F. Goodrich do Brazil S. A.—Productos De Borracha. A plant near Melbourne, Australia, was begun early this year by B. F. Goodrich Australia Pty. Ltd. and other Australian investors. A synthetic rubber plant is being built in Arnhem, Holland, by the B. F. Goodrich Chemical Co. in association with Algemene Kunstzijde Unie N. V. of Arnhem.

We publish below further information sent by the Rubber Research Institute of Malaya, on SP Masterbatches, briefly reported in our March, 1959 issue, page 918.

Wet SP Masterbatch will not be sold as such outside the producing countries, but will be incorporated into scrap grades in Malaya. The premium of seven cents Straits over RSS #1 is the figure suggested for the wet masterbatch if one producer makes it and sells it to another producer for incorporation into scrap grades. Shipments of SP brown crepe, in which the scrap material normally used to make 2X Thin Brown Crepe has been intimately mixed with wet SP masterbatch, have been sold at a price about half way between that of RSS #1 and 2X Thin Brown Crepe. The exact price is dependent upon the differential existing between RSS #1 and 2X Thin Brown Crepe, and a formula has been suggested to calculate it. SP brown crepe sells at a premium over 2X Thin Brown Crepe, but is not so expensive as RSS #1.

Samples of SP brown crepe and further information may be obtained from the Natural Rubber Bureau, 1631 K St., N.W., Washington, D.C.

MALAYA imported 18,173 automobile tires from Japan during the first 11 months of 1958, against 16,206 units during the whole of 1957.

The eventual production of olefin products in Algiers is planned by four important French concerns. Recently Société Algérienne d'Etudes pour la Polymérisation des Oléfines was formed in Algiers by Société Ethyléne Plastique in association with Air Liquide, Péchiney, and Huiles Goudrons et Dérivés, to undertake preliminary studies in connection with the production of polymers and copolymers of olefins, particularly ethylene and propylene.

(*Continued on page 492*)

MARKET REVIEWS

Natural Rubber

Rubber futures prices during the period under review (April 16-May 15) reached their highest levels since late 1956. Strength in the market was caused in part by the reentry of Communist China into the Singapore rubber market. This marked the first time that Red China had appeared in the market since last September. The Chinese bought 2,800 tons for May shipment, and reports from the rubber trade say that the Communists have placed orders for 4,000 tons more.

Settlement of the strike at United States Rubber Co., announced May 1, also contributed to the strength of the market. At the time of writing, the Goodrich and Firestone strikes were still continuing, although an early settlement is expected. These strikes are bound to have affected consumption. It is believed, however, that this year there will be no slowing down in production during the summer months, as in the past. The factories most likely will have to continue in active production during the coming months to make up the loss of production.

Toward the close of the period under review the rubber futures market has been seesawing for the better part of a week. Fits and starts in the market were said to have been caused in part by action of a House Appropriations Committee which introduced legislation (HR7040) that would deny the General Services Administration funds to replace rubber sold by it. The bill, which was subsequently passed by the House, is in direct conflict with Public Law 520. PL 520, in essence, provides that replacement must be made for every ton sold. Some quarters originally interpreted the announcement to mean that the government was to release present supplies, which would have weakened the spot market.

April sales, on the New York Commodity Exchange, amounted to 19,030 tons, compared with 13,310 tons for March contract. There were 22 trading days in April, and 22 during the April 16-May 15 period.

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 35.28¢ per pound for the April 16-May 15 period. Average April sellers' prices for representative grades were: RSS #3, 32.-87¢, #3 Amber Blankets, 31.96¢; and Flat Bark, 27.77¢.

Synthetic Rubber

As stated in the regular monthly report of The Rubber Manufacturers Association, Inc., strikes at several major rubber products manufacturing plants made themselves felt as consumption of new rubber in the United States for the month of April declined to 118,020 long tons, as compared to the record high of 147,080 tons in March. The April figure, however, was above the April, 1958, figure of 103,742 tons. Of this total new rubber consumed, synthetic rubber amounted to 77,170 tons, or 65.4%, and natural rubber amounted to 40,850 tons, or 34.6%.

Although consumption of synthetic rubber of all types dropped to 77,170 tons in April from the 95,089 tons used in March, production was maintained at 108,503 tons, as compared with the 111,377 tons in March. Exports rose to 25,685 tons in April from 21,712 in March and the even lower 15,000-17,000 tons in the earlier months of this year because of the continued lack of production at Canada's Polymer Corp., Ltd., plant and the general increase in rubber consumption worldwide. In addition, stocks rose about 6,000 tons in this country.

Consumption of synthetic rubber by types in long tons in April, as compared with March use, was as follows: SBR, 62,380, against 78,792; neoprene, 7,340, against 7,444; butyl 4700 against 5687; and nitrile, 2,750, against 3,166. The export figures on the same basis are particularly worth recording as follows: SBR, 19,100, against 16,-295; neoprene, 3,100, against 2,712; butyl 3000 against 2,238; and nitrile, 485, against 467.

Since in late May there was no indication of the end of the strikes at Firestone and B. F. Goodrich, or of the strike at Canada's Polymer Corp. synthetic rubber producing plant, it is expected that the synthetic rubber production-consumption picture will remain similar to that experienced in April until these strikes are settled.

The most active field of synthetic rubber at the present time is that of SBR oil-black masterbatches, the production of which amounted to 37,879 long tons for the first quarter of 1959, as compared with 9,938 long tons during the first quarter of 1958. Developments in this field are moving rapidly, and prices are quite low; this latter situation may alter after the strikes are over.

Latex

The price of latex rubber rose sharply during the period under review (April 16-May 15), although the increase has not been so great as in the case of dry rubber.

Covering by consumers of their immediate requirements has taken care of practically all nearby supplies, it is reported, and there is little now available for shipment before June/July. Only sporadic inquiry has been received for the more distant positions, and buyers appear hesitant to enter the market at the present price level.

The bulk latex market is unchanged

REX CONTRACT

1959	Apr. 17	Apr. 24	May 1	May 8	May 15
May	34.60	34.40	35.70	36.50	35.75
July	34.25	34.55	35.85	36.35	35.75
Sept.	33.60	34.25	35.80	36.10	35.31
Nov.	33.50	34.15	35.60	35.80	34.80
1960					
Jan.	33.45	34.05	35.45	35.65	34.60
Mar.	33.35	34.00	35.35	35.50	34.45
May	33.25	33.90	35.25	35.40	34.25

NEW YORK OUTSIDE MARKET

	Apr. 17	Apr. 24	May 1	May 8	May 15
RSS #1	33.88	34.50	35.63	36.50	35.75
2	33.38	34.13	35.25	36.25	35.50
3	33.00	33.88	34.88	36.13	35.38
Pale Crepe					
#1 Thick	34.75	35.25	36.75	37.25	37.63
Thin	34.63	35.25	36.50	37.00	37.13
#3 Amber Blankets	32.13	32.38	34.13	35.00	34.63
Thin Brown Crepe	31.88	32.13	33.88	34.75	34.38
Standard Flat Bark	27.75	28.00	29.50	30.50	29.88

from our last report and remains quite steady.

Consumption here during March was 7,052 tons, against 6,489 tons in February. United States stocks at the end of March stood at 9,375 tons, compared to 10,482 tons on February 28.

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantities, f.o.b., rail tank car, ran about 47.09¢ per pound solids. Synthetic latices prices were 21.5 to 38.2¢ for SBR; 37 to 53¢ for neoprene; and 46 to 60¢ per pound for nitrile types.

Final February and preliminary March domestic figures for all latices were reported by the United States Department of Commerce as follows:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Pro-duc-tion	Im-ports	Con-sump-tion	Month End Stocks
Natural				
Feb.	0	*	6,489	10,482
Mar.	0	*	7,052	9,375
SBR				
Feb.	7,578	—	7,083	7,753
Mar.	8,587	—	7,275	8,209
Neoprene				
Feb.	998	0	859	1,488
Mar.	1,013	0	1,054	1,441
Nitrile				
Feb.	1,161	0	1,009	2,535
Mar.	1,269	0	1,208	2,670

* Not available yet for period covered.

Scrap Rubber

Fairly quiet trading conditions prevailed in the scrap rubber market during the period under review (April 16-May 15). The strike at the Naugatuck reclaimer's plant had been settled for several weeks at the time of writing but that consumer was only beginning to start taking in scrap again, and only in limited quantities.

Reclaimers in the Akron area were claimed to be still tied up by the strikes. Scrap rubber prices were unchanged from previously quoted levels.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$11.00	$12.00
S. A. G. truck tires	nom.	15.50
Peeling, No. 1	nom.	23.00
2	nom.	20.00
3	nom.	15.50
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	3.25	3.25
Black	5.75	5.75
Red	6.25	6.25
Butyl	4.75	4.75

Reclaimed Rubber

During the period April 16-May 15 the rubber products industry was shaken by three big strikes. The companies affected also were reclaimers and sold reclaimed rubber outside their own companies; consequently the resulting reduction in reclaimed rubber manufacturing capacity threw the onus heavily on the remaining reclaimers, according to one source.

Since business volume in general has been high in this early part of 1959, this situation strained the facilities remaining in the reclaim industry. Naturally, however, these reclaimers are satisfying demands for their product as best they can. One rubber company which operates a reclaim division has indicated that because of the strike production and consumption of reclaimed rubber remained at a standstill in this company.

According to The Rubber Manufacturers Association, Inc., report, April production of reclaimed rubber was 22,300 long tons; while consumption was 22,450 long tons, in contrast to the more than 29,000 tons made and about 28,000 tons used in March.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.11
Third line	.1025
Inner tube, black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light-colored, medium gravity	.155
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity, at special prices.

Industrial Fabrics

The general interest in industrial grey cotton fabrics during the April 16-May 15 period, while off from recent levels, proved many buyers had minor quantity requirements to satisfy. The result accounted for various mills doing enough business to regard the situation as sounder, for the time being, than had been remotely anticipated.

Some quarters, with looms of currently favored widths and constructions fully sold up, would have welcomed a respite from the continuous inquiry to which they were subjected, according to one source. Others, able to care for a portion of the propositions in the market, sold up looms more solidly and into more distant weeks. At best, the sales activity indicated that buyers' needs were for deliveries extending into and through June, some into July, and but a dribble through the third quarter.

Buyers had need of a little more of numerous descriptions. These ran from broken twills to drills, sheetings to osnaburgs, flat ducks to sateens and specially prepared fabrics. Army duck has been experiencing a far broader market, due to boat use of finished goods, it was reported.

Industrial Fabrics

Broken Twills*		
54-inch, 1.14, 76x52	*yd.*	$0.52
58-inch, 1.06, 76x52		.585
60-inch, 1.02, 76x52		.5825
Drills*		
59-inch, 1.85, 68x40	*yd.*	385
2.25, 68x40		.325
Osnaburgs*		
40-inch, 2.11, 35x25	*yd.*	.2275
3.65, 35x25		.1525
59-inch, 2.35, 32x26		.295
62-inch, 2.23, 32x26		.305

Ducks

Numbered Duck†

List less 45%

Enameling Ducks*

	S. F.	D. F.
38-inch, 1.78 yd.	$0.3263	.3313
2.00 yd.	.275	.28
51.5-inch, 1.35 yd.	.45	.47
57-inch, 1.22 yd.	.4838	.50
61.5-inch, 1.09 yd.	.5413	.5538

Hose and Belting Duck*		
Basis	*lb.*	.60
Army Duck†		
52-inch, 11.70 oz., 54x40 (8.10 oz./sq.yd.)	*yd.*	.5925
Sheeting*		
40-inch, 3.15, 64x64	*yd.*	.2175
3.60, 56x56		.185
52-inch, 3.85, 48x48		.235
57-inch, 3.47, 48x48		.245
60-inch, 2.10, 64x64		.365
2.40, 56x56		.3275
Sateens*		
53-inch, 1.12, 96x60	*yd.*	.6275
1.32, 96x64		.56
57-inch, 1.04, 96x60		.615
58-inch, 1.02, 96x60		.68
1.21, 96x64		.61
Chafer Fabrics*		
14.40-oz./sq.yd. P.Y.	*lb.*	.71
11.65-oz./sq.yd. S.Y.		.61
10.80-oz./sq.yd. S.Y.		.65
8.9-oz./sq.yd. S.Y.		.67
40-inch, 2.56, 35x25		.25
60-inch, 1.71, 35x25		.435

*Net 10 days.
†2% 10 days.

Rayon and Nylon

Off to a good start in the first quarter of 1959, tire cord business slowed at the beginning of the second quarter owing mainly to a series of strikes in the tire industry, according to one source. Expectations are for a rising market in the latter part of the second quarter.

A new entrant in the nylon field is Allied Chemical,[1] now in full commercial production of a nylon-6 yarn.

[1] See this issue, p 463.

based on caprolactum, at its 20-million-pound Hopewell, Va., plant.

Rayon producers continued to convert production to super-2 yarns, and one manufacturer announced plans to change a portion of its textile rayon operation to industrial yarn production. Super-2 rayon is used almost exclusively in original-equipment tires, according to one source, and increased auto sales late in 1958 and early this year taxed the facilities of rayon producers which reportedly had been cut back in the face of nylon competition.

Nylon continues to move strongly in the replacement market, with producers anticipating an increase over the 40% share held in 1958. One nylon producer's shipments of nylon yarn were the highest on record, but dropped during the April strike period.

Tyrex viscose cord manufacturers were reported continuing to produce at full tilt to meet the demand. There had been some indication that Tyrex viscose cord is still in short supply. One Tyrex cord producer announced plans to convert facilities at one of its plants to Tyrex cord "as soon as commitments for that plant's rayon cord are fulfilled."

During this period Du Pont announced the development of a new adhesive-finished high-tenacity rayon yarn for reinforcing mechanical rubber goods. Identified as Super Cordura Type 272-F, the yarn reportedly offers new advances in processing, performance, and economy. The new yarn can be handled on conventional industrial weaving equipment, and processing costs are reduced since the adhesive quality of the yarn eliminates need of fabric dipping.

Inventory requirements are lowered since there is no need of maintaining undipped stock, and, in addition, the product is said to have a good shelf life, with no change in adhesion reported following 10 months' storage.

Totaled packaged production of rayon and acetate filament yarn during April was 64,600,000 pounds, consisting of 29,100,000 pounds of high-tenacity rayon yarn and 35,500,000 pounds of regular-tenacity rayon yarn. Production for March had been: total, 64,100,000 pounds, including regular-tenacity rayon yarn, 34,600,000 pounds, and high-tenacity rayon yarn, 29,500,000 pounds.

Filament yarn shipments to domestic consumers for April totaled 64,900,000 pounds, of which 28,800,000 pounds were high-tenacity rayon yarn, and 36,100,000 pounds were regular-tenacity rayon yarn. Shipments for March had been: total, 65,900,000 pounds; high-tenacity, 29,500,000 pounds; regular-tenacity, 36,400,000 pounds.

RAYON PRICES

Tire Fabrics

1100/490/2	$0.625/$0.78
1650/908/2	.685
2200/980/2	.655

Tire Yarns

High-Tenacity	
1100/ 490, 980	$0.66
1100/ 490	.66
1150/ 490, 980	$0.59/ .63
1165/ 480	.59/ .65
1230/ 490	.59/ .63
1650/ 720	.55/ .58
1650/ 980	.55/ .58
1875/ 980	.55/ .58
2200/ 960	.54/ .57
2200/ 980	.54/ .57
2200/1466	.64
4400/2934	.60
Super-High Tenacity	
1650/ 720	.60
1900/ 720	.58

NYLON PRICES

Tire Yarns

840/ 140	1.10/ 1.20
1680/ 280	1.12

Pelletized News

(Continued from page 486)

MALAYA'S political and economic stability are given as reasons by a representative of Bridgestone Tire Co., Ltd., Tokyo, Japan, why the company is considering the possibilities of establishing a tire factory there. Bridgestone, a leading Japanese tire manufacturer, said to import about 30,000 tons of rubber from Malaya annually, is contemplating the erection of a $10,000,000 (Straits) factory in the Federation, it is understood.

Production of rubber footwear in Malaya totaled 12,188,500 pairs in the first 11 months of 1958, against 13,602,700 pairs in the corresponding period of 1957. Singapore's share in 1958 was 1,503,500 pairs; while the Federation accounted for the remaining 10,685,000 pairs. Imports in the same periods rose from 2,269,000 to 2,911,900 pairs, and exports increased from 2,045,600 to 2,198,400 pairs.

ACHEMA 1961, Thirteenth Exhibition Congress of Chemical Engineering organized by the DECHEMA, will be held in Frankfurt, Germany, June 9-17, 1961 and will include the same group of exhibits as in 1958. ACHEMA 1961, like its predecessor, will occupy the whole of the Frankfurt Exhibition Grounds providing 700,000 square feet of floor space in 15 halls and 86,000 square feet in the open. Applications for stand space received by the beginning of December, 1958, already greatly exceed this total. Since the size and the scope of ACHEMA 1958 is considered to have reached optimum limits, the DECHEMA board has decided to keep to these limits; consequently applications for space for 1961 already received will have to be cut to permit accommodation of all exhibits.

A rubber mission to all rubber consuming countries to stimulate the sale of Malayan rubber and to make long-term contracts, if necessary, has been proposed by the newly elected president of the Malayan Estate Owners' Association, Dato Sir Clough Thuraisingham. He suggested that the mission be sponsored jointly by the Federation Government and the Rubber Producers' Council, and he added, that such extensive buyers of Malayan rubber as Russia and China could not and should not be disregarded because of political considerations and political ideologies.

NORTHWESTERN RUBBER CO., LTD., manufacturer of reclaim and allied products, Litherland, Liverpool 21, England, has appointed A. Nourry and W. Murray joint managing directors.

The Government of Sarawak plans expanding its rubber planting scheme to increase the acreage of high-yielding rubber from the present 40,000 acres to 60,000 acres. The scheme, which involves an increase in the subsidy paid to growers from the existing rate of $200 per acre to $250 per acre, is expected to cost about $11,000,000. To meet this figure, a levy of 2 cents per pound is to be imposed on rubber exported from the country. An official statement says that the scheme has proved to be very popular and that there is a demand for its enlargement.

DANUBIA PETROCHEMICAL, A.G., featured polypropylene last October at the Vienna Fall Fair. Danubia was formed recently by Oesterreichishce Stickstoffwerke, Montecatini, and private Austrian interests, to make various olefin products in Austria, including polypropylene. Visitors to the Fair showed lively interest in the samples of Moplen and Moplen goods, which had been provided by Montecatini, especially in the motor armatures made of this material. As a result of the many inquiries received from processors, Montecatini has agreed to place at the disposal of certain manufacturers quantities of the Italian product sufficient to enable them to process it experimentally and gain necessary experience with it before the Austrian company begins to bring out its own material, to be known as Daplen.

France has signed a trade agreement with Soviet Russia under the terms of which she will deliver during 1960-62, plastics machinery to a value of 1,100 million francs, including extruders for producing film from polyethylene and other synthetic materials, and machines for making polyethylene articles. In addition, France will supply a variety of equipment, to a total value of 6,300-8,000 million francs, for the chemical and rubber industries, among other machines for making synthetic fibers.

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RESEARCH CHEMIST— LATEX COMPOUNDS

To conduct applied research in the investigation and evaluation of synthetic latices and the design of new synthetic polymers. Degree, up to 5 years high polymer training, good knowledge of curing systems used in the vulcanization of elastomers. Recent graduates interested in this field will also be considered.

RESEARCH CHEMIST— DRY POLYMER COMPOUNDING

To conduct experimentation and development in dry polymer compounding; explore uses of specialty polymers in molded, extruded and solvent systems used in the fabrication of rubber or elastomeric products. Degree, up to 5 years experience in high polymer curing and processing techniques.

RESEARCH CHEMIST— LATEX IN PAPER (Paper Application)

To develop latices and compounds for industrial application of latex in paper and textiles. Degree, related experience plus essential knowledge of application methods and test procedures required.

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To originate and develop compounds from all types of natural and synthetic elastomers for specific end product use. Degree, prefer experience in dipped goods, but will consider foam latex background.

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To conceive and develop new and improved products through better design, appearance or performance. Must be capable of dealing with technical and professional people, able to coordinate activities of diverse groups, and in fact be the guiding force, director, or coordinator of specific product development projects. A B.S. in Engineering, Physics or Chemistry required, plus a minimum of 5 years technical development.

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STATISTICS

of the RUBBER INDUSTRY

U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1958						
Apr.	6,348	3,889	907	830	5,626	11,974
May	4,121	3,635	808	882	5,325	9,446
June	4,323	4,539	696	890	6,125	16,573
July	3,158	3,645	677	893	5,215	13,588
Aug.	5,140	5,474	892	1,103	7,469	12,609
Sept.	5,034	6,165	1,075	1,173	8,413	13,447
Oct.	6,994	7,617	1,170	1,308	10,095	17,089
Nov.	4,074	7,307	1,156	1,205	9,668	13,744
Dec.	7,950	6,891	986	1,033	8,910	16,860
1959						
Jan.	8,574	7,801	1,049	1,104	9,954	18,528
Feb.	5,746	7,578	998	1,161	9,737	15,483
Mar.*	....	8,587	1,013	1,269	10,869	.....

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

Year	Natural	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1958						
Jan.	42,530	60,561	4,508	6,154	2,076	115,829
Feb.	36,654	53,301	4,255	5,235	2,021	101,466
Mar.	38,132	55,166	4,279	5,152	2,022	104,769
Apr.	36,557	55,465	4,621	5,150	1,949	103,742
May	35,961	55,797	4,258	4,990	1,823	102,829
June	37,551	58,860	4,402	5,027	2,105	107,945
July	34,187	54,241	3,791	4,623	1,765	98,607
Aug.	39,380	59,825	4,277	5,935	2,364	111,781
Sept.	44,743	65,256	4,725	6,647	2,538	123,909
Oct.	48,875	73,699	4,982	7,378	2,759	137,693
Nov.	43,031	66,294	4,419	6,448	2,562	122,754
Dec.	46,891	71,731	4,897	6,955	2,606	133,080
1959						
Jan.	49,913	74,222	5,359	7,198	2,857	139,549
Feb.	47,345	72,558	5,256	6,885	2,694	134,738
Mar.*	51,991	78,792	5,687	7,444	3,166	147,080

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1958						
Apr.	17,415	7,756	1,398	1,744	10,898	28,313
May	17,604	7,240	1,292	1,732	10,264	27,868
June	17,078	7,337	1,267	1,888	10,492	27,570
July	15,516	6,693	1,312	1,990	9,995	25,511
Aug.	13,750	7,166	1,195	2,049	10,410	24,160
Sept.	12,482	6,842	1,354	2,096	10,292	22,774
Oct.	10,324	7,129	1,365	2,229	10,723	21,047
Nov.	8,795	7,810	1,498	2,530	11,838	20,633
Dec.	8,900	7,672	1,563	2,519	11,754	20,654
1959						
Jan.	10,025	7,822	1,551	2,418	11,791	21,816
Feb.	10,482	7,753	1,488	2,535	11,776	22,258
Mar.*	9,375	8,209	1,441	2,670	12,320	21,695

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1958				
July	18,136	18,350	1,087	26,442
Aug.	22,432	19,347	900	27,961
Sept.	22,641	21,771	1,005	26,676
Oct.	26,524	23,563	1,028	27,340
Nov.	22,450	21,271	1,051	27,680
Dec.	24,800	23,285	841	29,063
1959				
Jan.	25,790	25,002	1,157	27,157
Feb.	25,290	24,471	1,041	27,504
Mar.*	29,310	27,869	....	27,582

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Exports of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1958					
Mar.	15,647	757	3,424	410	20,238
Apr.	11,583	949	2,356	698	15,586
May	14,067	1,218	2,899	784	18,968
June	11,995	1,022	1,562	473	15,052
July	10,602	1,051	2,403	674	14,730
Aug.	8,521	972	2,603	558	12,654
Sept.	8,802	812	2,774	518	12,906
Oct.	12,292	1,407	2,547	553	16,799
Nov.	11,872	1,306	3,010	639	16,827
Dec.	12,634	1,258	2,484	520	16,896
1959					
Jan.	11,962	1,579	3,430	520	17,491
Feb.	11,615	1,169	2,404	648	15,836

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1958					
July	132,303	24,882	18,242	6,097	181,524
Aug.	136,735	24,618	16,344	6,224	183,921
Sept.	138,987	22,554	15,154	6,145	182,840
Oct.	134,613	22,091	15,474	6,356	178,534
Nov.	140,673	20,192	15,373	7,273	183,511
Dec.	143,533	18,770	15,488	7,292	185,083
1959					
Jan.	147,243	16,827	15,638	7,335	187,043
Feb.	148,606	16,339	15,990	7,468	188,403
Mar.*	146,971	14,441	14,701	7,753	183,866

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

SITUATIONS OPEN (Cont'd)

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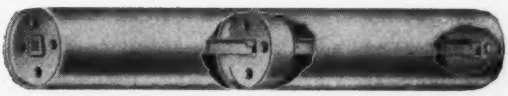

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CUTTING MACHINES, PULVERIZERS

UNITED RUBBER MACHINERY EXCHANGE

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World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	Eastern Europe and China	United King-dom	Other Foreign	Total Foreign	Grand* Total
1957	539.8	263.5	181.6	885.5	1,330.2	1,870.0
1958						
Jan.	42.6	21.8	15.3	73.5	110.6	152.5
Feb.	36.7	30.5	16.1	71.5	118.1	155.0
Mar.	38.2	31.6	16.9	73.7	122.2	160.0
Apr.	36.6	43.0	13.4	72.8	115.6	165.0
May	36.0	28.7	14.7	71.6	100.3	150.0
June	37.6	43.7	16.1	74.6	129.9	167.5
July	34.2	27.9	12.7	74.0	115.8	150.0
Aug.	39.4	33.4	8.7	60.6	102.7	147.5
Sept.	44.8	49.3	16.8	78.7	145.2	192.5
Oct.	48.9	40.5	14.2	82.1	136.8	185.0
Nov.	43.1	32.7	14.2	78.4	125.3	170.0
Dec.	47.0	46.5	17.0	...	...	187.5
Total	485.2	427.0	175.5	...	...	1,995.0
1959						
Jan.	50.0	...	15.3	...	...	192.5

*Estimated.

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; and Secretariat of the International Rubber Study Group.

World Production of Natural Rubber

(1,000 Long Tons)

Year	Malaya Estate	Malaya Native	Indonesia Estate	Indonesia Native	All Other	Total
1956	353.0	247.4	259.0	427.8	532.9	1,887.5
1957	369.8	268.9	252.2	432.3	556.7	1,892.5
1958						
Jan.	35.8	25.4	22.5	11.5	52.5	145.0
Feb.	28.8	22.9	20.0	8.8	37.0	117.5
Mar.	28.4	20.3	19.7	27.5	46.5	142.5
Apr.	26.7	18.3	16.8	24.0	44.2	130.0
May	27.2	18.2	17.7	20.1	44.3	127.5
June	31.2	21.9	19.7	26.0	43.7	142.5
July	36.5	23.8	20.8	45.3	48.5	175.0
Aug.	34.0	24.8	19.5	42.9	48.8	170.0
Sept.	33.8	23.6	19.0	38.6	52.5	167.5
Oct.	35.1	23.7	20.1	43.4	52.7	175.0
Nov.	31.9	19.8	20.1	43.3	52.4	167.5
Dec.	41.5	30.1	21.5	45.8	51.1	190.0
Total	390.9	272.7	237.4	377.1	576.9	1,855.0
1959						
Jan.	37.6	27.2	20.3	22.4	60.0	167.5

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; Secretariat of the International Rubber Study Group.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdom	Total† Continent of Europe	World† Grand Total
1957	929.3	47.5	57.4	154.8	1,262.5
1958					
Jan.	72.6	3.5	5.2	14.0	100.0
Feb.	64.2	3.5	5.2	13.5	92.5
Mar.	66.0	3.5	6.6	13.8	97.5
Apr.	66.6	3.8	4.7	13.5	95.0
May	66.3	4.0	5.5	13.3	95.0
June	69.8	4.5	6.0	13.8	100.0
July	63.9	3.9	4.7	13.5	92.5
Aug.	71.8	3.0	3.1	10.3	95.0
Sept.	78.5	4.2	5.8	14.0	110.0
Oct.	88.0	4.1	4.8	14.8	120.0
Nov.	79.0	4.3	5.2	13.8	110.0
Dec.	85.4	4.3	6.2	13.8	115.0
Total	872.2	46.7	63.0	164.0	1,225.0
1959					
Jan.	89.6	4.4	5.8	...	122.5

*Includes latices.
† Figures estimated or partly estimated.
Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany	Total
1956	1,079.6	120.7	10.7	1,211.0
1957	1,118.3	132.1	11.6	1,262.0
1958				
Jan.	102.7	10.9	1.8	115.4
Feb.	81.8	9.1	1.0	91.9
Mar.	83.6	11.3	1.2	96.2
Apr.	73.8	11.1	1.1	85.9
May	76.4	11.2	1.2	88.8
June	74.1	10.2	1.1	85.4
July	77.1	11.2	2.6	91.0
Aug.	87.3	10.9	2.3	100.5
Sept.	90.9	11.5	2.2	104.7
Oct.	100.9	12.5	2.4	115.9
Nov.	102.5	12.1	3.1	117.7
Dec.	101.6	12.9	2.7	117.3
Total	1,052.8	135.0	22.7	1,210.5
1959				
Jan.	108.5	13.0	...	...

Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

Year	Natural	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1957	553,043	907,534	66,936	110,721	33,124	1,671,358
1958						
Jan.	45,564	85,379	6,149	8,804	2,384	148,280
Feb.	46,018	66,402	4,996	8,200	2,157	127,773
Mar.	39,885	69,230	4,698	7,671	2,042	123,526
Apr.	41,278	59,263	4,324	7,973	2,197	115,035
May	36,183	62,161	4,462	7,450	2,338	112,594
June	28,279	62,567	1,926	7,251	2,306	102,329
July	25,823	64,944	3,698	6,248	2,193	102,906
Aug.	39,057	73,338	4,455	6,745	2,783	126,378
Sept.	41,343	75,111	4,117	8,586	3,165	132,322
Oct.	45,136	82,741	5,338	9,283	3,619	136,022
Nov.	41,819	84,382	4,145	10,394	3,575	134,647
Dec.	54,491	85,270	3,933	9,201	3,217	156,112
1959						
Jan.	54,950	90,261	4,992	9,991	3,260	163,454
Feb.	48,917	83,067	5,650	10,256	3,324	151,214
Mar.*	....	91,847	6,056	9,690	3,784	......

*Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United State Department of Commerce.

U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1957	75,009	68,305	9,539	10,230	88,074	163,083
1958						
Jan.	6,380	5,438	806	683	6,927	13,307
Feb.	5,380	4,475	640	806	5,921	11,301
Mar.	5,560	4,708	633	720	6,061	11,621
Apr.	4,847	4,093	707	797	5,597	10,444
May	5,004	4,102	785	795	5,682	10,686
June	5,304	4,165	639	919	5,723	11,027
July	4,531	3,433	629	703	4,765	9,296
Aug.	6,094	4,654	764	1,025	6,443	12,537
Sept.	6,748	5,779	820	1,017	7,616	14,364
Oct.	7,725	6,534	979	1,120	8,633	16,358
Nov.	6,540	6,009	798	1,108	7,915	14,455
Dec.	6,820	6,893	805	1,106	8,804	15,624
1959						
Jan.	7,184	6,886	925	1,244	9,055	16,239
Feb.	6,489	7,083	859	1,009	8,951	15,440
Mar.*	7,052	7,275	1,054	1,208	9,537	16,589

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

MACHINERY & SUPPLIES FOR SALE (Cont'd)

SURPLUS EQUIPMENT

4—Blaw Knox 6' x 40' Horizontal Vulcanizers with quick-opening doors, 250# working pressure, ASME.
1—Bolling 3-roll Laboratory Calender, 8" x 16".
2—Royle #½ Extruders, complete.
1—Banbury Midget Mixer with 2-HP gear motor.
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SPECIAL THIS MONTH

Multi-Opening 1,250-ton Baldwin-Southwark Press. Nine 50" platens, 30" diam. ram—inspect under power; 1—Banbury Mixer complete with 200 HP Motor. Spray Sides. Still in original location and never used since overhauling.
Top cap 20" x 60" Mill with 125-HP motor drive and controls. Located in Midwestern plant and can be given running test on location.
18" x 40" 3-roll Calender complete with fourth "L" roll and motor drive. Herringbone gear throughout.
A full line of rubber processing equipment including presses, mills, calenders, cutters, choppers, tubers, etc., etc.
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UNVULCANIZED RUBBER OR PLASTIC
BEVEL OR STRAIGHT EDGE
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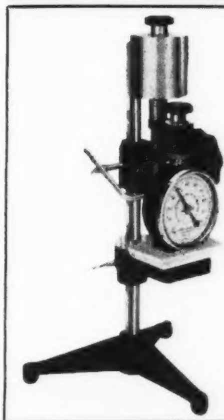

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U.S.A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumer's Price Index
All Rubber Products					
1939	121.0	$27.84	39.9	$0.75	
1957					
Nov.	209.0	93.20	40.0	2.33	121.6
Dec.	207.3	92.40	40.0	2.31	121.6
1958					
Jan.	200.9	87.48	38.2	2.29	122.3
Feb.	191.3	85.04	37.3	2.28	122.5
Mar.	184.0	87.02	38.0	2.29	123.5
Apr.	176.0	85.88	37.5	2.29	123.6
May	172.3	87.86	38.2	2.29	123.7
June	175.8	91.10	39.1	2.33	123.9
July	175.1	91.89	39.2	2.35	123.7
Aug.	181.2	96.80	40.5	2.39	123.7
Sept.	187.5	97.51	40.8	2.39	123.7
Oct.	194.5	97.27	40.7	2.39	123.7
Nov.	195.3	98.09	40.7	2.41	123.9
Dec.	198.2	102.66	41.9	2.45	123.7
1959					
Jan.	199.4	99.87	41.1	2.43	123.8
Tires and Tubes					
1939	54.2	$33.36	35.0	$0.96	
1957					
Nov.	84.0	106.62	39.2	2.72	
Dec.	83.6	105.84	39.2	2.70	
1958					
Jan.	81.6	98.52	36.9	2.67	
Feb.	78.5	93.02	35.1	2.65	
Mar.	76.0	98.05	37.0	2.65	
Apr.	72.1	95.67	36.1	2.65	
May	70.4	99.48	37.4	2.66	
June	71.2	103.63	38.1	2.72	
July	71.0	106.59	38.9	2.74	
Aug.	72.5	113.96	40.7	2.80	
Sept.	74.1	113.40	40.5	2.80	
Oct.	75.3	113.24	40.3	2.81	
Nov.	76.2	115.75	40.9	2.83	
Dec.	77.1	121.40	42.3	2.87	
1959					
Jan.	77.1	116.28	40.8	2.85	
Rubber Footwear					
1939	14.8	$22.80	37.5	$0.61	
1957					
Nov.	18.0	78.96	40.7	1.94	
Dec.	17.9	79.35	40.9	1.94	
1958					
Jan.	17.5	74.87	39.2	1.91	
Feb.	17.0	74.68	39.1	1.91	
Mar.	16.7	76.61	39.9	1.92	
Apr.	16.5	75.46	39.3	1.92	
May	16.3	75.85	39.3	1.93	
June	16.3	77.20	40.0	1.93	
July	15.9	75.25	39.4	1.91	
Aug.	16.4	77.18	40.2	1.92	
Sept.	16.8	76.62	39.7	1.93	
Oct.	17.1	77.01	39.9	1.93	
Nov.	17.2	77.22	39.6	1.95	
Dec.	17.1	78.01	39.8	1.96	
1959					
Jan.	17.2	77.81	39.7	1.96	
Other Rubber Products					
1939	51.9	$23.34	38.9	$0.61	
1957					
Nov.	107.0	85.05	40.5	2.10	
Dec.	105.8	84.03	40.4	2.08	
1958					
Jan.	101.8	80.94	39.1	2.07	
Feb.	95.8	80.32	38.8	2.07	
Mar.	91.3	79.87	38.4	2.08	
Apr.	87.4	79.87	38.4	2.08	
May	85.6	80.29	38.6	2.08	
June	88.3	83.77	39.7	2.11	
July	88.2	83.53	39.4	2.12	
Aug.	92.3	86.24	40.3	2.14	
Sept.	96.6	89.21	41.3	2.16	
Oct.	102.1	88.78	41.1	2.16	
Nov.	101.9	88.54	40.8	2.17	
Dec.	104.0	92.60	41.9	2.21	
1959					
Jan.	105.1	91.72	41.5	2.21	

Source: BLS, United States Department of Labor.

U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
Passenger Car						
1957	32,724	56,605	888	90,217	93,547	19,818
1958						
Feb.	1,998	3,777	57.5	5,833	6,320	19,820
Mar.	1,845	4,726	49.3	6,621	6,569	19,786
Apr.	1,594	5,517	61.4	7,173	6,522	19,051
May	1,874	5,593	55.8	7,523	6,715	18,263
June	1,667	6,387	62.8	8,117	7,306	17,465
July	1,756	6,502	60.0	8,318	6,368	15,490
Aug.	847	5,807	57.2	6,711	6,753	15,535
Sept.	1,170	5,425	63.9	6,659	7,134	16,045
Oct.	1,522	5,369	80.6	6,972	7,983	17,134
Nov.	3,056	3,651	57.7	6,765	7,182	17,420
Dec.	3,701	3,977	61.2	7,739	8,046	17,818
1959						
Jan.	2,631	6,028	56.9	8,716	8,859	17,998
Feb.	2,442	4,932	60.2	7,434	8,962	19,435
Mar.	2,930	6,261	61.7	9,253	9,959	20,181
Truck and Bus						
1957	4,041	8,544	845	13,430	13,394	3,408
1958						
Feb.	254	598	52	904	994	3,572
Mar.	269	608	46	923	1,004	3,659
Apr.	282	666	55	1,002	955	3,607
May	299	626	54	980	938	3,571
June	265	794	54	1,113	988	3,456
July	265	940	51	1,255	920	3,114
Aug.	208	871	57	1,136	1,009	2,986
Sept.	273	940	41	1,253	1,143	2,880
Oct.	316	1,106	59	1,482	1,361	2,779
Nov.	313	669	42	1,023	1,211	2,983
Dec.	356	734	63	1,153	1,330	3,171
1959						
Jan.	329	714	47	1,090	1,325	3,401
Feb.	364	679	74	1,117	1,308	3,584
Mar.	406	842	56	1,304	1,391	3,680
Total Automotive						
1957	36,764	65,150	1,734	103,647	106,941	23,225
1958						
Feb.	2,253	4,374	110	6,737	7,314	23,392
Mar	2,114	5,334	95	7,543	7,573	23,446
Apr.	1,876	6,183	116	8,175	7,477	22,658
May	2,173	6,220	110	8,503	7,652	21,834
June	1,932	7,182	117	9,231	8,293	20,920
July	2,020	7,442	111	9,573	7,288	18,604
Aug.	1,055	6,679	115	7,848	7,762	18,521
Sept.	1,442	6,365	105	7,912	8,277	18,925
Oct.	1,838	6,476	140	8,454	9,344	19,913
Nov.	3,369	4,320	100	7,788	8,393	20,403
Dec.	4,057	4,711	124	8,892	9,376	20,988
1959						
Jan.	2,961	6,742	104	9,806	10,184	21,399
Feb.	2,805	5,611	135	8,551	10,270	23,019
Mar.	3,336	7,103	117	10,557	11,350	23,862

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Automotive Inner Tubes

(Thousands of Units)

	Shipments					
Year	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1957	3,045	35,684	1,077	39,806	39,763	7,671
1958						
Apr.	223	2,956	64	3,243	3,624	7,609
May	225	2,742	68	3,035	3,530	8,189
June	202	3,332	67	3,601	3,476	8,156
July	215	3,174	76	3,466	2,890	7,680
Aug.	160	3,097	74	3,331	3,305	7,664
Sept.	207	3,228	63	3,498	3,390	7,657
Oct.	244	3,237	84	3,567	3,768	7,869
Nov.	264	2,575	60	2,899	3,319	8,372
Dec.	288	3,029	94	3,411	3,491	8,617
1959						
Jan.	287	4,450	63	4,800	3,806	7,536
Feb.	311	3,924	81	4,316	4,094	7,364
Mar.	339	4,013	83	4,435	4,459	7,629

Source: The Rubber Manufacturers Association, Inc.

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Carbon Black Statistics—First Quarter 1959

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; GPF, general-purpose furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, super abrasion furnace black; ISAF, intermediate super abrasion furnace black.

(Thousands of Pounds)

	Jan.	Feb.	Mar.
Production			
Furnace types			
Thermal	12,187	11,675	12,469
SRF	23,004	21,767	23,108
HMF	6,487	5,169	5,694
GPF	5,000	5,545	6,942
FEF	21,579	19,286	23,372
HAF	39,114	37,892	46,534
SAF	293	—	—
ISAF	16,605	14,490	19,262
Total furnace	124,269	118,824	137,381
Contact types	26,890	24,695	28,029
Totals	151,159	143,519	165,410
Shipments			
Furnace types			
Thermal	12,283	12,658	14,904
SRF	26,251	26,009	29,465
HMF	6,420	5,122	6,299
GPF	6,977	7,245	7,397
FEF	24,511	20,924	25,949
HAF	45,800	42,890	47,161
SAF	615	583	897
ISAF	17,391	16,739	19,859
Total furnace	141,248	132,170	151,931
Contact types	31,852	28,221	29,214
Totals	172,100	160,391	181,145
Producers' Stocks, End of Period			
Furnace types			
Thermal	23,181	22,198	19,759
SRF	35,764	31,522	25,165
HMF	6,856	6,903	6,298
GPF	7,658	5,958	5,503
FEF	17,213	15,575	12,998
HAF	38,010	33,012	32,382
SAF	5,071	4,487	3,586
ISAF	38,708	39,459	38,862
Total furnace	172,461	159,114	144,553
Contact types	88,646	85,120	83,935
Totals	261,107	244,234	228,488
Exports			
Furnace types			
Total furnace	29,543	19,442	—
Contact types	15,604	12,930	—
Totals	45,147	32,372	—

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

U.S.A. Rubber Industry Sales and Inventories

(Millions of Dollars)

	Value of Sales*				Manufacturers' Inventories*			
	1956	1957	1958	1959	1956	1957	1958	1959
Jan.	415	496	448	508	935	1,047	1,100	1,013
Feb.	445	495	413	456	970	1,036	1,087	1,053
Mar.	451	476	412	517	979	1,030	1,112	1,076
Apr.	445	490	429	...	970	1,031	1,047	....
May	464	481	428	...	985	1,024	1,020	....
June	450	458	445	...	975	1,027	986	....
July	459	514	478	...	987	1,045	980	....
Aug.	436	481	438	...	1,007	1,074	1,024	....
Sept.	429	481	464	...	1,007	1,074	1,024	....
Oct.	454	490	493	...	1,022	1,097	1,022	....
Nov.	463	431	472	...	1,024	1,101	1,018	....
Dec.	461	427	518	...	998	1,092	994	....
Total	5,372	5,720	5,438	...	Av. 988	12,678	12,414	....

* Adjusted for seasonal variation.
Source: Office of Business Economics, United States Department of Commerce.

U.S.A. Rubber Industry Economic Indicators

	Production Index*					% Return†	
Year	All Rubber Products	Total Tires & Tubes	Auto Tires	Truck & Bus Tires	Miscellaneous Rubber Products	On Sales	On Investment
1956	133	121	123	119	144	4.5	9.0
1957	135	123	134	107	147	4.2	8.5
1958							
Jan.	123	106	111	99	140		
Feb.	120	112	118	104	127		
Mar.	118	108	115	98	128	3.0	5.2
Apr.	115	103	112	91	125		
May	112	102	113	88	121		
June	122	117	131	99	127	3.4	6.4
July	103	96	105	85	108		
Aug.	127	110	118	99	142		
Sept.	137	117	122	109	156	4.5	9.2
Oct.	143	129	131	125	156		
Nov.	145	128	131	124	160		
Dec.	137	128	132	122	146	4.5	9.6
1959							
Jan.	151	138	149	124	163		

* F.R.B. Index of Industrial Production Unadjusted (1947-49 Avg., 100%).
† Base Data F.T.C.-S.E.C. Quarterly Financial Reports—% Calculated by RMA.

U.S.A. Synthetic Rubber Industry, Wages, Hours

Year	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings
1957	107.40	40.8	26.3
1958			
Jan.	109.62	40.6	2.70
Feb.	109.21	40.6	2.69
Mar.	110.03	40.6	2.71
Apr.	108.14	40.2	2.69
May	110.03	40.6	2.71
June	112.61	41.1	2.74
July	111.52	40.7	2.74
Aug.	112.75	41.0	2.75
Sept.	113.98	41.0	2.78
Oct.	114.67	41.1	2.79
Nov.	117.88	41.8	2.82
Dec.	120.56	42.3	2.85
1959			
Jan.	122.55	42.7	2.87

Source: BLS, United States Department of Labor.

U.S.A. Production of Cotton, Rayon, and Nylon Tire Fabrics

(Thousands of Pounds)

	Cotton and Nylon*		Rayon Tire Cord		
	Cotton Chafer Fabrics and Other Tire Fabrics	Cotton and Nylon Tire Cord and Fabrics	Woven	Not Woven	Total All Tire Cord and Fabrics
1957					
Jan.-Mar.	11,028	20,676	69,610	21,872	124,297
Apr.-June	10,456	24,852	63,195	16,037	115,418
July-Sept.	9,102	24,852	54,968	10,509	100,046
Oct.-Dec.	9,207	23,868	58,356	9,216	100,647
1958					
Jan.-Mar.	9,750	18,820	56,522	8,372	167,924
Apr.-June	7,890	24,725	†	†	80,533
July-Sept.	7,999	24,904	†	†	91,984
Oct.-Dec.	10,533	26,392	†	†	107,532

* Cotton and nylon figures combined to avoid disclosing data for individual companies.
† Withheld to avoid disclosing figures for individual companies.
Source: Bureau of the Census, United States Department of Commerce.

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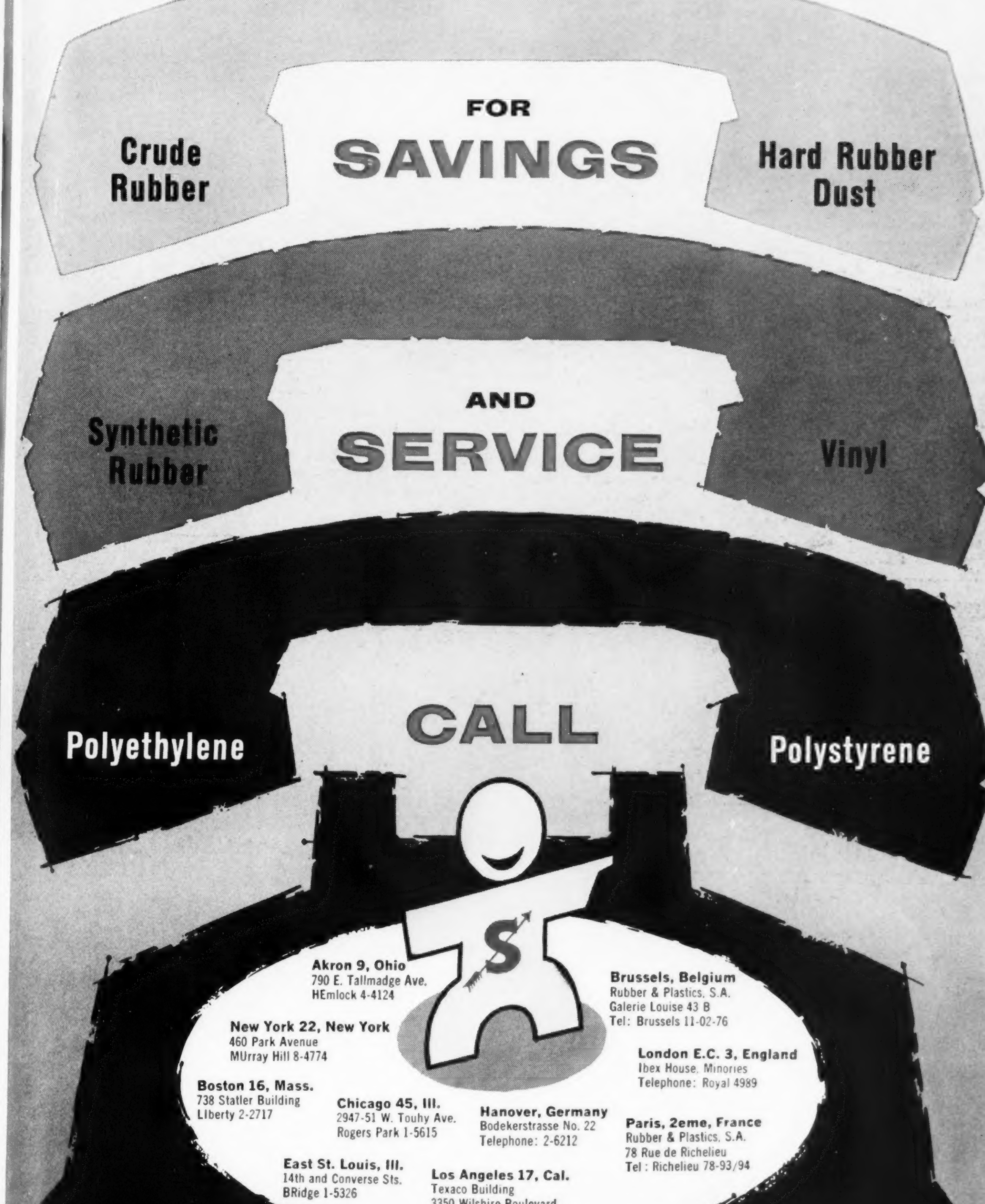
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